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South Carolina
Forestry Commission

A MESSAGE FROM THE STATE FORESTER


Scott Phillips, State Forester

South Carolina is blessed with a rich diversity of forest resources. Comprising approximately 12.9 million acres, these forests range from hardwood coves in the foothills of the Appalachian Mountains to maritime forests along the Atlantic Coast. Along with this diversity come myriad benefits that these forests provide as well as a range of challenges that threaten their function and existence.

One of the most tangible benefits is the economic impact of forestry, contributing over $21 billion to the state's economy and providing nearly 100,000 jobs. South Carolina's forests also provide recreational opportunities for her citizens, diverse habitat for numerous wildlife species, and scenic beauty for all to enjoy. In addition, trees sequester carbon, provide for clean air and water, contribute to the health of our citizens, and mitigate the impacts of flooding and stormwater.

The state's forests also face many challenges. Some of these are biological, such as attacks by insects and diseases, while others are weather-related, such as drought and storms. Still other perils are due to human activity, the most notable of which are wildfires and conversion of forestland to other uses.

The 2020 South Carolina Forest Action Plan is a major update of the 2010 Statewide Forest Resource Assessment and Strategy, which was used to identify and quantify the issues affecting our state's forests – and to focus Commission capacity on the most important tasks. A significant accomplishment with this update is the simultaneous revision of this Forest Action Plan with the Forestry Commission's Strategic Plan so that these documents are truly integrated and align our actions to drive us toward our vision for South Carolina. The updating process engaged a full range of resource management experts and forestry-related organizations, working together to re-examine these issues and develop strategies for the present and future.

This collaborative partner-based approach will be crucial as the SC Forestry Commission moves further into the 21st century and embraces the challenges that lie ahead. We invite you on this journey and to work with us to ensure that our forests continue providing the economic, environmental and social benefits that are critical to our quality of life.

Best regards,

Scott L. Phillips

Scott Phillips
State Forester
South Carolina Forestry Commission

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ACKNOWLEDGMENTS

This document is a product of the combined effort of a diverse team of natural resource professionals. As shown below, these individuals represent several organizations and brought a varied perspective to each of the issues that they addressed.

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EXECUTIVE SUMMARY

This Forest Action Plan provides an analysis of the benefits that the forests of South Carolina provide as well as an examination of the forces that threaten them. These benefits and threats can be summarized by the following issues, listed below in order of their priority ranking, as determined by South Carolina Forestry Commission agency leadership.

Public Perceptions about Forestry

Many South Carolina residents value the environmental role of forests, such as protecting water quality, as more important than their role as the provider of raw materials for one of the leading manufacturing industries in the state. With increased urbanization, many citizens also do not have a close connection with the land. As a consequence, restrictive regulations such as outdoor burning ordinances and tree protection ordinances are proposed with little or no consideration of the potential effects of this legislation on forestry operations and forest health.

Water Quality and Quantity

Surface water that is free from pollutants and sediment and provides habitat requirements for wildlife is considered to be of high quality. Forestry operations generally have little detrimental effect on water quality. Nevertheless, the South Carolina Forestry Commission, cooperating with the South Carolina Department of Health and Environmental Control, aggressively promotes adherence to Best Management Practices. South Carolina has an abundant supply of freshwater, but is not immune to water quantity issues as evidenced by recent legal actions involving neighboring states.

Fragmentation and Parcelization

As South Carolina's population grows, forested tracts of land continue to become fragmented by the addition of roads, powerlines, solar farms, and buildings. Many larger tracts are also being subdivided into parcels that make traditional forest management difficult to accomplish. This trend has implications for the long-term sustainability of the forest resources of South Carolina.

Economic Impact

Forestry is a crucial segment of the state's economy, contributing $21.2 billion annually. Over the last 10 years, forest markets have grown and expanded steadily, through the expansion of mill capacity, the addition of new operations, and the development of new markets such as whole log exports. In addition, we see the opportunity for carbon credits, biomass and related products to become more important as issues such as climate change and the need for energy independence gain momentum on the federal level. Continued support for these current and emerging markets is critical to provide economic incentives for landowners to actively manage their forestland.

Wildfire Risk

Over 1,400 wildfires occur each year in South Carolina, two-thirds of which originate from escaped debris burns or are deliberately set. With the growth in the state's population, more and more of these fires damage not only timber and wildlife habitat, but also homes and other structures.

Forestry Regulations

In many cases, forest regulations can be a disincentive for forest landowners to actively manage their forests and may be an incentive to convert their forestland to another use. Regulations may take the form of ordinances, taxes, and legislation such as the Endangered Species Act. Some forms of taxation, however, such as lower property tax rates for forested tracts, have a favorable effect on forest management. In addition, regulations pertaining to conservation easements, carbon credits and cost-share programs can actually incentivize landowners to practice sustainable forestry.

Stormwater Management

Impervious surfaces such as roads, roofs, driveways, streets, and parking lots increase not only stormwater volume, but also the rate of flow. Maintenance and expansion of urban canopy cover is an effective tool that can be used to reduce the impact of stormwater runoff.

Prescribed Fire

Forest managers in South Carolina conduct prescribed burns on about 400,000 acres each year. Experts agree that nearly twice this amount needs to receive this treatment, but obstacles such as smoke management and liability concerns, fragmentation of forest land, and changing attitudes about prescribed burning make increasing the amount of acreage burned a major challenge.

Forest Health Threats

The threats to the health of the forests in South Carolina include native, non-native but naturalized, and non-native plants, diseases, and insects. The three most significant threats to South Carolina's forests currently are southern pine beetle, Ips beetles, and cogongrass. They are important because of their potential economic, aesthetic, and ecological impacts.

Air Quality

South Carolina's forests play a major role in filtering the air of pollutants such as ozone and particulate matter. In addition, trees sequester carbon dioxide and emit oxygen through the process of photosynthesis.

Urban and Community Forests in South Carolina

Trees are major capital assets in communities. The quantity, placement and size of trees in populated places can positively impact and provide millions of dollars in savings regarding energy conservation, air filtration, stormwater runoff mitigation, and carbon dioxide sequestration. In addition, urban forests increase public health through improved air quality, reduced stress, increased exercise and improved social connections.

Population Growth

The population of South Carolina is predicted to grow from 5 million in 2020 to over nearly 6 million by 2030. As the population grows, more forest land will be converted to housing and commercial development, stormwater runoff will increase, public demand on forest attributes will rise, and the probably that wildfires will impact structures will increase.

Climate Change

Increased incidence of droughts and storms, increased number and severity of wildfires, and more numerous and severe insect and disease outbreaks are likely if climate change predictions hold true. Sustainable management of forests can help reduce the negative effects of this change.

Other Issues

The issues below were not ranked by SCFC leadership, but were identified by stakeholders as vital to the management of South Carolina's forests.

Critical Habitats

Critical habitats are those that are necessary to maintain species diversity across all forest types. Among those considered worthy of special attention in South Carolina are the longleaf pine ecosystem, bottomland hardwood stands, and early successional habitat.

Source Water Protection

Source water protection is a proactive approach to safeguard, maintain, or improve the quality and/or quantity of drinking water sources and their contributing areas. Effectively managing the areas through which water travels and the activities that occur in those areas helps protect the quality and quantity of available drinking water.

INTRODUCTION

Background

As part of the Food, Conservation, and Energy Act of 2008 (the 2008 Farm Bill), Congress required each state to conduct an assessment of their forests and develop strategies to address the issues affecting them. South Carolina, along with the other states, completed its Forest Resource Assessment and Strategies in June 2010. These documents later became known as Forest Action Plans, which were re-visited in 2015 to ensure their validity. The results of South Carolina's 2015 "pulse check" can be found here: www.trees.sc.gov/docs/scfra-fiveyearreview.pdf

National Priorities

The 2008 Farm Bill established a new set of national priorities for federal assistance for private forest conservation. A new subsection (c) was added to the Cooperative Forestry Assistance Act:

(c) Priorities - in allocating funds appropriated or otherwise made available under this Act, the Secretary shall focus on the following national private forest conservation priorities, notwithstanding other priorities specified elsewhere in this Act:

(1) Conserving and managing working forest landscapes for multiple values and uses.

(2) Protecting forests from threats, including catastrophic wildfires, hurricanes, tornados, wind storms, snow or ice storms, flooding, drought, invasive species, insect or disease outbreak, or development, and restoring appropriate forest types in response to such threats.

(3) Enhancing public benefits from private forests, including air and water quality, soil conservation, biological diversity, carbon storage, forest products, forestry-related jobs, production of renewable energy, wildlife, wildlife corridors and wildlife habitat, and recreation.

Thus, the 2008 Farm Bill requires that forestry assistance aim to conserve working forests, protect and restore forests, and enhance public benefits from private forests.

Forest Action Plans

The 2008 Farm Bill required each state to analyze forest conditions and trends in the state and delineate priority rural and urban forest landscape areas. From this assessment, statewide forest resource strategies were developed to address critical issues facing the forests of the state. These strategies also served as the basis for formulating competitive proposals for State & Private Forestry (S&PF) funds.

The three S&PF national themes are:

- Conserve working forest landscapes
- Protect forests from harm
- Enhance public benefits from trees and forests

In South Carolina, the South Carolina Forestry Commission is the lead state agency in the development of the assessment and resource strategies for the state's forests.

Final guidance for the Forest Action Plan came from the Landscape Scale Restoration (LSR) Program (www.fs.usda.gov/managing-land/private-land/landscape-scale-restoration) and the 2008 Farm Bill. Forest Action Plans are integral to LSR and required as an amendment to the Cooperative Forestry Assistance Act (CFAA), as enacted in the 2008 Farm Bill.

The 2008 Farm Bill required three components in the assessment and planning process:

- *A Statewide Assessment of Forest Resources*—provides an analysis of forest conditions and trends in the state and delineates priority rural and urban forest landscape areas which are the focus of this document.
- *A Statewide Forest Resource Strategy*—provides long-term strategies for investing state, federal, and other resources to manage priority landscapes identified in the assessment, identifying where federal investment can most effectively stimulate or leverage desired action and engage multiple partners.
- *An Annual Report on Use of Funds*—describes how S&PF funds were used to address the assessment and strategy, including the leveraging of funding and resources through partnerships for any given fiscal year.

To ensure that federal and state resources are focused on important landscape areas with the greatest opportunity to address shared management priorities and achieve meaningful outcomes, the SC Forestry Commission worked collaboratively with key partners and stakeholders to develop a statewide assessment of the forest resources. This statewide assessment provided a comprehensive analysis of the forest related conditions, trends, threats, and opportunities within the state. The assessment includes:

- An analysis of present and expected future forest conditions, trends, and threats on all ownerships in the state;
- The identification of forest-related threats, benefits, and services consistent with the S&PF redesign national themes; and

- A delineation of priority rural and urban forest landscape areas to be addressed by the state resource strategy through geospatial analysis.

The geospatial analysis includes data layers that address each of the following core issues or themes:

- Development Risk
- Fragmentation
- Wildfire Risk
- Forest Health Risk
- Fish and Wildlife Habitat
- Water Quality and Supply
- Economic Potential
- Green Infrastructure

Each core issue (theme) is tied to one or more of the S&PF redesign themes and associated national objectives. The state's assessment of forest resources includes a description of all spatial analysis methods and logic and one or more maps that identify priority forest landscape areas.

The Southern Group of State Foresters (SGSF) and USDA Forest Service (USFS) Southern Region represent 13 southern states and Puerto Rico. More than 5 million private owners control 89 percent of forests in this area. While each state ultimately decided how to approach its own state assessment, members of the SGSF elected to collectively create a template, or sample state assessment, to be used (if desired) by all southern states. The SGSF and USFS Southern Region identified the following common set of regional priority issues or opportunities for southern states to consider collectively while guiding their own assessment process:

- Significant forest ecosystems and landscapes
- Urbanization, fragmentation, and loss of forestland
- Fire
- Forest health
- Water quality protection and watershed management
- Wildlife habitat and species conservation
- Forest resource market opportunities

This assessment addresses each of the regional priority issues listed above.

2020 Forest Action Plan Development

In July 2019, the South Carolina Forestry Commission's State Forester developed general guidance for revision of both the 2010 State Forest Resource Assessment and Strategies and the agency's Strategic Plan. Since these documents are closely related, updating them concurrently promised increased efficiency and alignment. Through a survey of agency leaders, it was found that the basic framework of both the agency Strategic Plan and the Forest Resource Assessment were still valid. The issues described in the Assessment remain a concern, although some of the language required updating.

For assistance in facilitating the collaborative work involving multiple group sessions, as well as the revision these documents, the SC Forestry Commission contracted with the University of South Carolina's Division of Human Resources, Office of Organizational and Professional Development.

The agency held a Strategic Planning Retreat for Executive Staff and the Board of Commissioners on December 5-6, 2019, to review and refine the Forestry Commission's mission statement, to develop key themes for an agency vision statement, and to identify key organizational values. An additional strategic planning meeting was held with agency program managers on January 10, 2020, to develop strategies in more detail. A draft plan was then circulated to all Forestry Commission employees via a detailed survey seeking feedback and refinements. The response was noteworthy, with 230 employees (68%) completing the survey, and 132 (7%) submitting written comments. This input was studied and used to finalize the plan, readying it for approval by Commission Members.

Work on the 2020 SC Forest Action Plan began in earnest following these meetings with the formation of three working groups organized around the three S&PF national themes. The leaders of each of these groups recruited subject-matter experts, and all reviewed the 2010 document to determine needed revisions.

During a Forest Action Plan stakeholder meeting on March 6, participants provided input on each of the issues identified in the 2010 Plan. They discussed the current state of each issue, its relative importance, and related initiatives – and also shared relevant planning documents and spatial data. Included in this group of stakeholders were members of the Forest Stewardship Coordinating Committee, SC DNR, the State Technical Committee, Forest Legacy lead agency, federal land management agencies, and representatives of military installations in South Carolina.

Equipped with this input, working group members re-wrote the sections of the 2010 State Assessment, updating data and re-crafting the descriptions of issues. They also revised the citations and provided sources of additional information.

For the spatial component of the 2020 SC Forest Action Plan, working group members provided input regarding priority layers. They shared maps that their organizations had developed and discussed how various initiatives across the landscape of South Carolina could complement each other. This GIS data was designed to address where limited resources should be focused. The data identified was both spatial and non-spatial in nature and included sets of criteria that should be considered. The criteria considered included richness, threats or risks, and areas of opportunity.

Finally, the 2010 strategies were updated based on the revised issues descriptions and the SC Forestry Commission's newly updated Strategic Plan. A strategy matrix was developed that shows action items that will be employed to address these issues. The matrix also lists performance measures which are quantitative goals that will help the agency track progress as the Forest Action Plan is implemented.

Highlights from Forests of South Carolina, 2018

Area

- Total forest area has remained relatively stable over time and amounted to 12.9 million acres in 2018. Forests occupy 66 percent of the land area of South Carolina.
- Timberland area now totals 12.7 million acres, a decrease of 1.6 percent from 2008. Hardwood timber types occupy nearly 4.9 million acres (40 percent) of timberland which has decreased 6.3 percent during the past 10 years.
- Softwood forest types occupy 5.9 million acres or 48 percent of the State's timberland area an increase of 3.8 percent since 2018. The area of planted pine has remained stable over this period at 3 million acres.
- The remainder of forests are in mixed softwood/ hardwood types, comprising 1.5 million acres, or 12 percent of timberland area.
- Loblolly-shortleaf pine is the predominant forest-type group and occupies 5.5 million acres.

Ownership

- Most (52 percent) of the State's 12.9 million acres of forest land is owned by private individuals. Forest industry owns only 3 percent, or 330,000 acres, a sharp decrease from 16 percent in 2001, and from a peak of 2.6 million acres in 1986. Conversely, corporate ownership has risen from 16 percent in 2001 to 33 percent (4.2 million acres) as of 2018.
- Nearly 6.7 million acres of South Carolina's private forest land is in the hands of approximately 237,000 private individuals. The majority (94 percent) of family forest lands currently have the potential to be managed for a variety of uses including the production of timber (Butler et al. 2016).

Volume

- As of 2018, total all live volume on timberland in South Carolina amounted to 26.1 billion cubic feet, which is the most volume ever reported for the state.

- All live volume is split almost evenly between softwoods (13.7 billion cubic feet) and hardwoods (12.4 billion cubic feet). The loblolly-shortleaf pine species group accounted for 11.6 billion cubic feet (85 percent) of the all live softwood volume.

Net Growth and Removals

- Total net annual growth of all live trees on timberland averaged 1.26 billion cubic feet per year between 2013 and 2018.
- Net growth for all live softwood trees on timberland averaged 928.9 million cubic feet per year between 2013 and 2018. Softwood removals during that same period averaged only 726.1 million cubic feet per year. Planted pine stands account for 497 million cubic feet (39 percent) of total net annual growth and 382 million cubic feet (40 percent) of total annual removals. Pine plantations, however, only occupy 3.0 million acres (24 percent) of the total forest area in South Carolina.
- Hardwoods during the same period averaged 333.1 million cubic feet per year. This growth was substantially more than the average hardwood removal of 229.1 million cubic feet per year reported for the period.

Economic Impact

- Forestry is a crucial segment of the state's economy, contributing $21.2 billion annually.
- In South Carolina, forestry has emerged as the leading manufacturing industry in terms of employment and labor income. Just over 47,000 people, earning $2.58 billion in labor income, are directly employed in the forestry sector as defined by a 2018 economic Impact Analysis for Planning (IMPLAN) analysis. Because of the multiplier effect, the total number of jobs that forestry contributes to South Carolina is over 98,000.

- The export of South Carolina forest products was estimated at $1.25 billion in annual value in 2019, almost 12% less than those reported in 2018 and 7% below export levels in 2015. Exports from the top three industries -paper & paperboard, wood pulp, and solid wood products- represented 49%, 35% and 9% of the total reported for 2019 respectively; whereas those from the three bottom sectors: wood furniture, wood chemicals, and equipment/machinery used for pulp & paper manufacturing, together accounted for the remaining 7%.
- Approximately 93 sawmills, pulpwood mills, and other primary wood-processing plants were operating in South Carolina in 2020. These mills averaged nearly 696 million cubic feet of timber products per year between 2011 and 2015.
- Roundwood harvested for saw log and pulpwood production amounted to between 238 and 381 million cubic feet, respectively. These two products accounted for 81 percent of the total roundwood production for the state.

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OVERARCHING ISSUES

South Carolina's rapid population growth and the resulting change in public perceptions about forestry affect all aspects of managing the forest resources of South Carolina. In addition, climate change, with its associated weather extremes, will influence the state's forests and urban trees.

Population Growth

Description

South Carolina has the sixth fastest growing population in the nation (Williams 2019). As the graph below indicates, the population of South Carolina rose from fewer than 2.5 million in 1960 to more than 5 million in 2020 (US Census Bureau, 2020).

This trend is expected to continue. Projections are for South Carolina's population to grow to nearly 6 million by 2030 (SCRFAO 2020).

Effects on Forest Resources

Population growth is impacting the forest resources of our state in several ways. People moving to South Carolina from other parts of the country account for most of the population growth, not native South Carolinians having more children (Williams 2019). These new residents often have different views on forestry than people who have lived in the state all of their lives. For example, anecdotal information indicates that many of the newcomers are less tolerant of smoke from prescribed burning. They also tend to be less familiar with timber harvesting operations, so they may advocate for regulations against logging. Many of these newcomers are accustomed to older, natural hardwood forests versus the young pine plantations that are actively managed and commonplace in South Carolina.

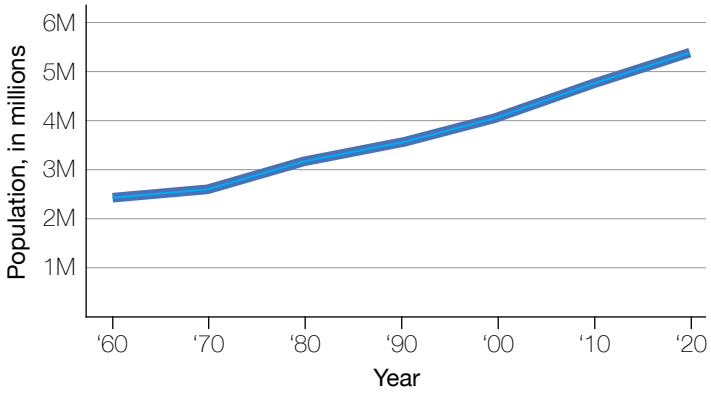
Population growth patterns are having a negative effect on forests. Much of this growth is in the form of urban sprawl, which "strongly impacts the urban ecosystems it creates and the natural and agro-ecosystems that it displaces and fragments" (Terando et.al. 2014). Over the next 50 years, the extent of urbanization is predicted to increase by over 100%. The increasingly fragmented natural landscape would reduce habitat availability, suppress natural disturbance processes (such as wildfires), hinder management actions that come into conflict with urban areas, and likely eliminate existing corridors" (Terando et.al. 2014).

Because existing urban areas continue to expand, population growth is occurring at a much higher rate in counties with large cities as opposed to more rural counties (see Figure 2 below).

Much of the land that is being developed for commercial and residential use is highly productive. "South Carolina ranked 9th among 50 states in the rate of conversion of prime agricultural and forest lands to development between 1992 and 1997" (Ulbrich and London 2008). Once this conversion occurs, these properties are no longer available for the production of forest products and become unsuitable for most species of wildlife. In addition, carrying out forest management practices, such as prescribed burning and timber harvesting on forestland near these residential areas, becomes more difficult (Wear et al. 1999).

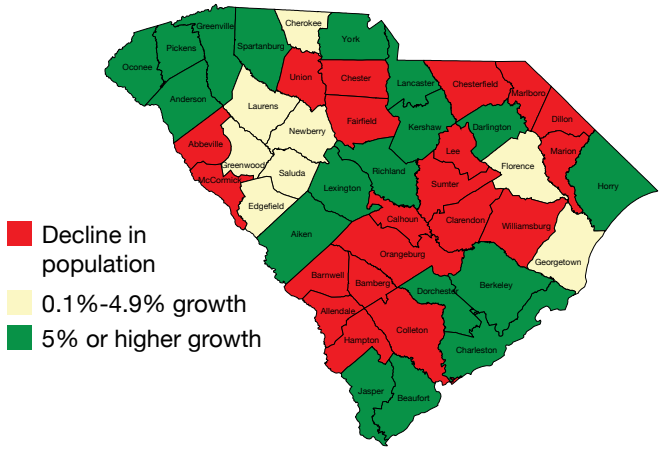
Loss of wildlife habitat and timber production are only two of the consequences of population growth in South Carolina. This growth also results in a loss of many of the benefits of managed forests such as aesthetic and recreational value and water quality protection. The

Figure 1. South Carolina population, 1960-2020



Source: US Census Bureau (2020 population is an estimate)

Figure 2. South Carolina population change, by county, 2010-2019



increased impervious surfaces associated with development results in higher amounts of stormwater runoff as well as increases in ambient air temperature (SCFC 2020).

Population growth also increases the risk of human-caused wildfires. "With more people, there is increased risk of fires caused by people…debris burning, equipment use, smoking, campfires and arson" (USFS 2010). In addition, controlling wildfires on forestland near residential or commercial development is more difficult than controlling wildfires that occur in rural areas. Firefighters place higher priorities on human lives and structures than they do on trees, consequently they must adjust their tactics when developed areas are nearby. For example, firefighters may be severely limited in using backfires because houses would be placed in danger using that technique.

Current Activities

Several programs are mitigating the effects of population growth on South Carolina's forest resources. South Carolina Forestry Commission urban forestry specialists work with municipal and county planning organizations to develop tree ordinances, conduct tree inventories, and provide other technical assistance. This advice helps to reduce the negative effects of development and promotes healthy urban forests (SCFC 2020a). The Forest Legacy Program, coordinated by the South Carolina Department of Natural Resources, seeks to protect environmentally sensitive forestland using conservation easements or fee simple title (USFS 2008). The Assessment of Need (AON) for South Carolina's Forest Legacy Program is attached as Appendix xx. The AON has been updated with map amendments, updated citations and statistics, new evaluation criteria, goals, figures, and tables. For additional information, please refer to the AON.

In addition, through the Forest Stewardship Program SC Forestry Commission foresters work with landowners to develop management plans that help them optimize the productivity of their forestland to meet the landowner's objectives (SCFC 2020b). Also, the Forestry Commission manages approximately 93,000 acres on five state forests on a sustainable basis to provide forest products, recreation, wildlife habitat, and other benefits.

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Public Perceptions about Forestry

Introduction

A challenge for the forest industry and public forestry agencies has been and always will be public perception. Thoughtful, sound management of forested lands involves activities can appear destructive or downright dangerous to public safety, as in the case of prescribed fire. Overcoming the layperson's attitudes toward such practices as clearcut timber harvesting, thinning, monoculture species planting, and prescribed fire has been an ongoing challenge for those in the forestry community. Public attitudes are shaped by many sources, including the media, school curricula, and special interest groups. Some information available for public consumption is poorly informed and inherently problematic.

Status

The Southern Forest Resource Assessment (SFRA) sought to address concerns raised by professionals and the lay public about the current state and the future of the forests in the American Southeast. This SFRA report contains a chapter on southern residents' values and attitudes about the forest resource which illustrates the perceptions across socioeconomic strata of the forest resource. This resource is an integral part of the culture, economy and environmental aesthetic (Wear et al. 2002).

The following key findings reflect the challenges seen in South Carolina for promoting forestry and its affiliated industries to a population whose connection to forest lands is merely one of proximity.

- Southern residents hold stronger (more intense) values about public than private forests. Among the four values of forests mentioned to respondents, the one considered most important was clean air, and the one rated as least important was wood production.
- Southern residents have moderately strong pro-environmental attitudes. They favor additional funding of environmental protection and stricter environmental laws and regulations.
- A review of the related literature reveals a strong and fundamental shift over the past two decades in public values about forests and their management. Values have shifted away from a commodity-oriented anthropocentric[1] approach to forest management toward inclusion of natural biological factors in a biocentric[2] approach.

- Southern women and younger people have stronger biocentric values about forests and stronger pro environmental attitudes than men and older people. There are only minor differences in environmental attitudes and values between other demographic groups such as urban and rural residents, long-term and short-term residents, landowners and non-landowners, people of different races, and people who live in different regions within the South.

It is this disconnect between the purpose of forestry and the general public's values attached to forested lands that may stand as one of the hurdles for the future of forestry and timber-related industry in South Carolina. If the demographic trend is toward urban centers, will an industry birthed in a natural resource stand the test of public opinion? The above findings suggest a strong association of the forests with something that must be protected, not managed in a regime that includes final harvests and regeneration.

A more recent Penn State paper reported that in the Southeast, much of the public is somewhat tolerant of timber harvesting if they perceive that it is for ecosystem maintenance (Kreyer et.al. 2019) These researchers found more support for landowner assistance programs than for increased regulation. They also discovered that forest health will likely be the metric that the public uses to assess the effectiveness of various public policies.

Current Activities

From its inception, the South Carolina Forestry Commission has dedicated itself to education. Promoting state-of-the-art silvicultural techniques, offering various services, disseminating timely information on forestry legislation and tax code incentives, and keeping a finger on the pulse of the state's timber market for the benefit of landowners have all been part of the Forestry Commission's collective stock-in-trade for decades. However, public entities tend to benefit mainly those who are familiar with what they have to offer. Owners of forested land often are well aware of the information, services, and expertise the USDA Forest Service and the SC Forestry Commission offer. If landowners are not aware of the assistance available, they often know enough to at least turn to these agencies for help. The perception of the people working in the profession is that the general population, however, lacks a basic understanding of the purpose and goals of forestry.

SCFC 2020-2030 Strategic Plan

Public awareness is prominent in the South Carolina Forestry Commission's strategic plan.

GOAL: Raise Awareness about Our Forests

Strategy 1 – Promote the Forestry Commission as South Carolina's first and foremost source for forest management information and assistance.

Strategy 2 – Educate the public on the environmental benefits of working forests and the role of strong markets and family forest owners in keeping our forests healthy.

Strategy 3 – Continue to promote the economic benefits of forestry.

Strategy 4 – Engage stakeholders to maintain a forestry friendly business environment.

Strategy 5 – Promote trees and forests as a way to offset the effects of a changing climate.

Strategy 6 – Provide accurate and timely information on the inventory, utilization, and health of South Carolina's forests.

Tomorrow's policy decisions will be made by today's young people. Programs, such as the Forestry Commission's Wood Magic Forest Fair, aim to impart a commodity-based value of forestry to hundreds of South Carolina's fourth graders each year. It is a comprehensive environmental education program that is correlated to state curriculum standards in science and language arts. To help measure the effectiveness of this program, teachers are asked to administer a pre-test to the students before they attend Wood Magic and a post-test after the program. The results of these tests are compiled and examined to determine the educational success of Wood Magic. A summary of these results indicates a clear positive shift in attitudes and understanding of forestry practices (www.trees.sc.gov/wmfair.htm) (SCFC 2020).

While these results demonstrate a pro-industry shift in understanding by the end of the program, the results also

suggest a deficit in knowledge prior to attending this field trip. The children's attitudes prior to Wood Magic were being shaped and informed by their environment. It is reasonably safe to assume these influences include teachers, parents, popular media, and general experience. Shaping attitudes about South Carolina's forest resource must entail reaching back through all of these channels in order to foster a general appreciation for the state's number one manufacturing sector in the decades ahead.

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Glossary

[1]anthropocentric: assuming human beings to be the final aim and end of the universe
(source: http://dictionary.reference.com/browse/anthropocentric)

[2]biocentric: centered in life; having life as its principal fact
(source: http://dictionary.reference.com/browse/bioocentric)

Climate Change

Definition

"Observed warming since the mid-20th century has been uneven in the Southeast region, with average daily minimum temperatures increasing three times faster than average daily maximum temperatures" (USGCRP 2018). This warming is due to increasing levels of carbon dioxide and other greenhouse gases that are being released into the atmosphere (The National Academies 2008). Much of this pollution is caused by the burning of coal for electricity generation and by the consumption of diesel fuel and gasoline for transportation. In fact, fossil fuel consumption results in 79 percent of greenhouse gas emissions in the United States (Hockstad et al. 2009). The resultant warming of the atmosphere causes changes in long-term weather patterns as well as an increase in the incidence of droughts, flooding, and severe weather (USFS 2020). Once known as global warming, this change in the Earth's overall climate is now referred to as climate change.

Current Status

The effects of these changes in long-term weather patterns have not been fully quantified in South Carolina as of this writing. There is considerable debate among scientists as to the degree to which these effects will be felt in our state in the future. However, scientific data indicates that negative effects of climate change to various Southeastern ecosystems will include the following: timing and intensity of rainfall and snowfall events; longer wet periods; longer dry periods (resulting in droughts); hotter summers and warmer winters with more frost-free days; increased storm events that are more intense (i.e. hurricanes and thunderstorms and flood events); changes in surface water availability and depth, temperature, pH, and salinity; sea level rise and habitat inundation; altered fire regimes; increased wildfire risk; and shifts in species assemblages.

Trends

Perhaps the biggest impact to South Carolina due to climate change is on average temperatures which are projected to rise up to 9 degrees over the next 70 years (SCDNR 2011). If the current warming trend continues, the natural ranges of both plant and animal species may change. The range of some tree species may move northward and to higher elevations. Models predict that oaks would most likely give way to conifers such as hardy pines as the climate warms. In addition, invasive species could become more of a problem

in some areas. The spread of these non-native species may be facilitated by longer growing seasons (USFS 2020). Increases in or emergence of new pathogens are predicted which will impact both plant and animal species (SCDNR 2011).

Another climatic change that is being predicted is an increased incidence and severity of droughts. Even short-term droughts reduce the productivity of forests both for wood products and for wildlife habitat. An additional impact to wildlife is failed hard and soft mass production which is critical forage for many species during certain seasons of the year. Drought can cause canopy trees grow more slowly under these conditions while the shrub and herb layers of the forest also decrease in nutrient capacity for wildlife. Prolonged droughts can make trees more susceptible to insect and disease attacks and result in increased mortality.

In addition to the stress that droughts place on trees and other plants, climate change can increase the reproductive capacity of bark beetles (Dix 2009). Larger populations of insects may develop which will enable these pests to successfully attack trees whose vigor has been reduced by a lack of rainfall.

Climate change predictions also include the likelihood of more numerous and more severe wildfires (Hilbruner 2009). Longer growing seasons result in a larger amount of fuel on the forest floor. Droughts will cause these fuels to dry to historically low levels which will make them more available for intense combustion.

When rains do come, they are predicted to be more intense bursts, scouring some landscapes as floods become more frequent. Warmer weather patterns will fuel more intense and frequent storms, including hurricanes, strong thunderstorms, and tornadoes.

South Carolina, as well as many other coastal states, are already experiencing sea level rise as the result of melting ice caps and thermal expansion due to increased atmospheric temperatures. In Charleston County, for example, the sea level has risen 10 inches in the last 70 years (https://sealevelrise.org/states/south-carolina/). In recent years, however, that rise has accelerated to an inch every two years. Examples of the effects can be seen in maritime forest erosion and the skeletonization of trees resulting in "boneyards" (SCDNR 2011). Saltwater infusion into formally brackish or freshwater ecosystems will have a major effect on the plants and animals that inhabit these areas. Species that are less salt-tolerant will suffer reduced growth and higher levels of mortality. An indirect effect of the rise in sea level will be increased pressure on the forest resources from the human population along the coast. As coastal residents are forced to move inland, more and more forestland will be converted into housing and commercial development (Landner 2009).

In addition to (or because of) the effect of climate change on trees, many species of wildlife will be affected as well. Fragmentation of wildlife and fish habitat is likely to occur if temperatures continue to increase and droughts become more frequent and/or severe. Bird populations and ranges may fluctuate dramatically in response to the uncoupling of migration and food and shelter resources (e.g., insect emergence and bud break). Fish and wildlife species that are not able to adapt to climate changes will be forced to either relocate or face extinction (Solomon 2009a).

In contrast to all these predicted negative effects, some scientists assert that several positive effects of climate change are possible. One of these effects is longer growing seasons that will result in more growth per year for some species of trees. Higher levels of CO2 will "very likely increase photosynthesis for forests, but this increase will likely only enhance wood production in young forests on fertile soils" (Backlund et al. 2009). Nitrogen deposition will also probably cause increased forest growth where adequate water is available.

Role of Forests

Trees and forests play a key role in moderating the effects of climate change. U.S. forests currently offset about 10 percent of the carbon dioxide (700 million tons) that is produced by the burning of fossil fuels. Under diligent management, forests have the potential to offset an additional 1200 million tons and the use of forest-derived biofuel may offset 600 million tons more. Carbon can also be stored in forest products that do not decay rapidly as well as in standing trees (Solomon 2009). Managing forests sustainably helps keep the amount of carbon in these areas relatively constant (Buford 2009). In addition to helping with carbon sequestration, forests can "to a substantial degree, mitigate the dire effects of atmospheric pollution" (Malmsheimer et al. 2009). In short, sustainable forest management can enable our forests to "play a positive and significant role to help address global climate change" (Broekhoff et al. 2009). In addition, some commercially important species such as longleaf pine may do well in a hotter, drier environment, offering a viable and valuable alternative forestry product versus the current loblolly pine.

Limiting climate warming will require increased mitigation and natural climate solutions, including land stewardship, the potential of which in the United States is poorly

understood. Research suggests a maximum potential of 1.2 Pg CO2e/ year in the United States through natural climate solutions, increased carbon sequestration and storage through forest management, reforestation, avoiding conversion, fire management, and improved plantations - contributing a maximum mitigation potential 660 Tg CO2e /year (Fargione et al. 2018).

Non-industrial private forest ownership (NIPF) is prevalent in the southeastern US, accounting for roughly 58% of the total acreage of forest land (Butler et. al. 2016). However, research also suggests that only 35% of non-industrial private forest landowners in the southeastern United States hold supportive beliefs on climate change and carbon sequestration while 47% hold neutral beliefs. Further research on NIPF owners indicates that timber production is the main objective of 40% of owners and 39% choose multiple-use as their main objective. Regardless of forest objective, the majority of NIPF in the southeastern US have a poor understanding of forest carbon sequestration. Research has found that 55% of NIPF owners would be willing to participate in carbon sequestration when such practices were more profitable than timber management and 25% if it was revenue neutral (Khanal et al. 2016). Nonindustrial private landowners have a willingness to participate in carbon sequestration activities, but do not know enough about what practices qualify, the underlying science, or the mechanics of a carbon project. If there were a financial incentive to implement a forest carbon project, then 80% of landowners may be willing to change their forest management practices.

The SC Forestry Commission encourages the active management of private forestland through several programs. One of these is the Forest Stewardship Program which is funded by the USDA Forest Service and is coordinated at the state level by the SC Forestry Commission. Through this program, foresters work with landowners to develop management plans designed to optimize the productivity of their forest land to meet the landowner's objectives (SCFC 2020). In addition, several cost-share programs are available to assist private landowners with the cost of reforestation (SCFC 2020a).

The SC Forestry Commission also provides professional advice to other state agencies that own land. This technical assistance often results in a higher level of productivity for the forest land that these agencies manage. The Forestry Commission manages over 93,000 acres of state forest property with help from a forest planning model. This GIS-based computer model maximizes the economic return from these lands while providing for wildlife habitat, recreation, and aesthetics.

Carbon sequestration through improved forest management is only one piece of the climate mitigation puzzle. While conventional wood utilization in South Carolina captures and stores carbon (paper, wood fiber), these effects are only realized temporarily as the carbon stored is quickly released back into the atmosphere when these products are discarded and broken down. Research indicates that long-term, durable wood products such as mass timber or cross-laminated timber (CLT) for use in building construction may provide a climate- and forest market-friendly solution to carbon storage (Gustavsson et al. 2017). The benefits of CLT are well-studied in Europe and Asia (Darby, Elmualim, and Kelly 2013; Guo et al. 2017; Peñaloza, Erlandsson, and Falk 2016), citing comparatively shortened construction times, increased energy saving through heating efficiencies, and fewer associated emissions of atmospheric carbon over the lifetime of the building. In fact, for every ton of carbon in wood product substituted in place of non-wood products, there occurs an average greenhouse gas emission reduction equivalent of approximately 3.9 tons of atmospheric carbon (Sathre and O'Connor 2010). However, CLT is not well-understood in the United States (Mallo and Espinoza 2014). As CLT has just recently been addressed in the International Building Code (will be added as part of the 2021 IBC), local authorities and municipalities must be involved in CLT projects in the United States, making the process complex. Additionally, engineers and architects are not fully aware of CLT's availability due to the small amount of time this product has been on the market. Furthermore, some perceive CLT to be a material that is inferior to concrete and steel (Mallo and Espinoza 2014). Strong timber markets can help ameliorate the loss and fragmentation of forests by encouraging private landowners to keep their land forested. The US South, with its abundant timber resources and robust forest industries, is well-positioned to become a significant producer of and market for CLT. Efforts should be made in South Carolina to further the activities of other groups and promote the use of CLT in construction across the state and the Southeast.

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CONSERVING SOUTH CAROLINA'S WORKING FORESTS

This section addresses issues that affect the viability of forests that are managed for such uses as timber production, wildlife habitat, soil and water protection, aesthetics, and recreation.

The forests of South Carolina provide a number of economic and societal benefits such as manufacturing, employment, recreation, aesthetics, and environmental protection. Demands on our forest resources, as well as threats to the future status of our working forests, are as great as at any time in recent history. South Carolina is experiencing significant change in the management and use of our woodlands. Population growth, ownership changes, residential development, nonconsumptive demands, and the presence or absence of markets for our forest products will determine the future of South Carolina's forests. To ensure that our forests can meet the current and future economic, ecological, cultural, and recreational demands placed on them, managers must focus their efforts to address changing landowner objectives, parcelization and fragmentation, current and emerging markets, forest regulation, critical habitats, and cultural/recreational concerns.

Forest Area

Forests are the predominant land cover in South Carolina. Forests currently occupy 66 percent or 12.9 million acres of the land area in South Carolina (USFS, 2019). The vast majority of our forests are classified as timberland[1] with 40 percent (6.8 million acres) in hardwood forest types, 48 percent (5.9 million acres) in softwood forest types, and 12 percent (1.5 million acres) in a mixed forest type. Loblolly-shortleaf pine is the predominant forest type group, occupying 5.5 million acres. The remaining 6.5 million acres of land in South Carolina are in other uses such as agriculture or urban development. Long term trends show that forest land has been relatively stable, while agricultural land has declined by 60 percent, or approximately 2 million acres (Conner et al. 2009). Between 2005 and 2016, average annual land use change has decreased from a high of roughly 169,000 acres to 83,000 acres in the current period. However, there has been a continuing increase in area in urban development, which has increased from less than 1 million acres in 1968 to nearly 2.9 million acres in 2018, and grew on average 24,000 acres per year between 2001 and 2018 (Brandeis et al. 2017).

SCFC 2020-2030 Strategic Plan

The Commission's strategic plan prioritizes the sustainability and active management of South Carolina's forests.

GOAL: Conserve Working Forests

Strategy 1 – Support landowners with programs and services that promote active forest management and help them meet their goals.

Strategy 2 – Promote and increase the responsible use of prescribed fire.

Strategy 3 – Demonstrate practices for the active, sustainable, multiple-use management of State Forests, and engage other public land owners to do the same.

Strategy 4 – Actively seek opportunities to acquire land to grow the State Forest system.

Forest Ownership

Most of South Carolina's forest land is currently owned by private individuals or families, making up about 52 percent of the total. The amount of forest land held by forest industry in South Carolina, and throughout the southern region, has declined substantially in recent years. In 2018, forest industry holdings comprised just 330,000 acres, or only 3 percent of the total, in South Carolina. This area is down from the 2.6 million acres reported in 1986 when

Figure 3. Forestland ownership in South Carolina, 2018

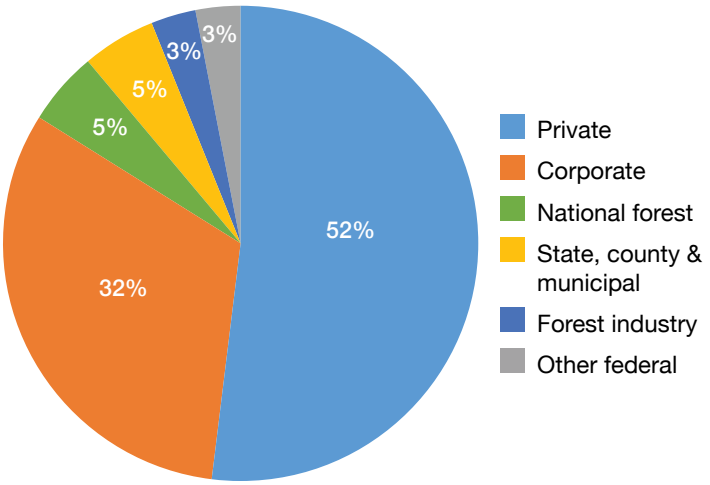


Table 1. Size of ownership of forestland in South Carolina

Size of Forest Landholdings *acres*	Area Acres *thousands*	Area Percent *of total*	Owners Number *thousands*	Owners Percent *of total*
1-9*	413	5.7%	151	63.7%
10-19	319	4.4%	26	11.0%
20-49	797	10.9%	28	11.8%
50-99	893	12.2%	15	6.3%
100-199	1,211	16.6%	9	3.8%
200-499	1,594	21.8%	6	2.5%
500-999	733	10.0%	1	0.4%
1,000-4,999	1,211	16.6%	1	0.4%
5,000-9,999	96	1.3%	<1	0.0%
10,000+	32	0.4%	<1	0.0%
Total	**7,299**		**237**	

**Due to reporting changes, values for 1-9 acre owners were estimated based on previous studies.*

forest industry holdings were at their peak.

Conversely, non-forest industry corporate ownership has increased and now comprises approximately 33 percent, more than 4.2 million acres, of the state's total forest lands. The majority of corporate ownership is held by timber investment management organizations (TIMOs), real estate investment trusts (REITs), and limited liability corporations (LLCs). The remainder of South Carolina's forest lands is divided among national forests (5%); state, county, and municipal government (5%); and other federal lands (3%).

The majority of South Carolina's forest land is managed by 262,000 private forest landowners. As shown in Table 1 below, the size of these ownerships varies from 1-9 acres to greater than 10,000 acres. The largest class of landowners (151,000 or 64 percent of all landowners) own tracts smaller than 10 acres. These landowners, however, account for less than six percent of the forest land in South Carolina. The vast majority of forested acres, 94 percent, are in landholdings greater than 10 acres. This information is relevant because conventional wisdom indicates that it is not financially viable to manage forest products on tracts less than 10 acres in size. Therefore, based on tract size alone, the majority (94 percent) of family forest lands currently have the potential to be managed for a variety of uses including the production of timber (Butler et al. 2016).

Forest management offers many landowners an economically viable means of keeping land in forest use. Many landowners enjoy multiple benefits from their property, such as recreational opportunities, wildlife viewing, scenic beauty, and personal satisfaction of conserving natural resources. Periodic income from timber provides an alternative to converting forest land to other uses. Property taxes are also lower for lands in bona fide agricultural and forest use.

Fragmentation and Parcelization

Thousands of acres of forest land in South Carolina change ownership every year. Although it is unknown what changes in land ownership mean for South Carolina's forest lands, major concerns are fragmentation, parcelization, and the conversion of forests to non-forest uses (Hatcher et.al. 2013). The distinction between parcelization and fragmentation of the forest is important because their causes and effects can be different. Parcelization generally refers to division of ownerships that result in smaller holdings. Parcelized ownerships generally fragment the forest landscape, constrain management options, adversely influence forest health and wildlife habitat, and directly and indirectly lead to forest loss.

Fragmentation refers to isolation of forest tracts from one another and generally results from parcelization of ownership. Fragmentation can also be caused by introducing infrastructure such as roads and power lines into the forest, or forest management activities that have the same effect. The effects of fragmentation on habitat of certain wildlife species have been well-documented, but effects on timber availability, water quality, and forest manageability, while believed to be negative, are less certain. The projected population increase for South Carolina and the related urbanization will only exacerbate these issues.

To help mitigate the threat of forest land conversion, the South Carolina Forestry Commission, in partnership with other natural resource agencies, encourages private landowners to actively manage their lands. This management often results in cash flow, which underscores the value of land retention. Agency foresters write forest management plans tailored to landowners' objectives and help them implement recommended practices. This type of assistance has proven to be invaluable – forest landowners are twice as likely to carry out forest management activities when they have received professional assistance (Kilgore et. al. 2015).

Partnerships are key to the success of these efforts to keep forests as forests. Several landscape level initiatives are active in South Carolina such as the Indian Creek Woodland Restoration Initiative, the Pee Dee Partnership, and the Lower Savannah River Watershed Initiative. In addition, there are three Longleaf Implementation Teams in South Carolina: the Sandhills Longleaf Pine Conservation Partnership, the Sewee Longleaf Conservation Cooperative, and the SoLo-ACE Longleaf Partnership. All of these groups provide outreach and oftentimes financial assistnace to private landowners to encourage retention of forestland.

Another way that the agency promotes active forest management is through the use of cost-share programs designed to incentivize landowners to carry out reforestation practices. The Forest Renewal Program (FRP), described below in the Forestry Regulations section, is funded in large part by the wood-using industry in South Carolina. The Southern Pine Beetle prevention program (SPB) utilizes US Forest Service funds to help defray landowners' costs in carrying out practices that help reduce the amount of mortality caused by this damaging insect. South Carolina Forestry Commission foresters also assist USDA agencies such as the Natural Resources Conservation Service (NRCS) and Farm Service Agency (FSA) with their financial assistance programs.

Timber Supply

While South Carolina has an abundant supply of timber, it has been dominated over the last two decades by the development of a large cohort of southern yellow pine, often referred to as the wall of wood, which is now entering mature sawtimber size.

Southern yellow pine is the most important component of our state's industry (softwoods accounted for 87% of all harvesting in 2015). Total softwood volume is currently 12.4 billion cubic feet, and the loblolly-shortleaf pine species group accounted for 85 percent of this volume. However, 50% of this group's volume is in the dominant cohort age classes (ages 21-35) with softwood volume peaking in the 12" diameter class. SRTS (Subregional Timber Supply) models forecasts softwood sawtimber volumes to increase until peaking in 2027. Wood supply affects every aspect of forestry in the state, including timber prices, timberland ownership patterns, harvesting, tree planting, wood procurement specifications, industry expansion, and ultimately the economic impact of forestry to the state's economy.

This unbalanced size class portfolio will continue to drive industry decision making for the foreseeable future, as the state's softwood forest gradually shifts back to a normal age class distribution.

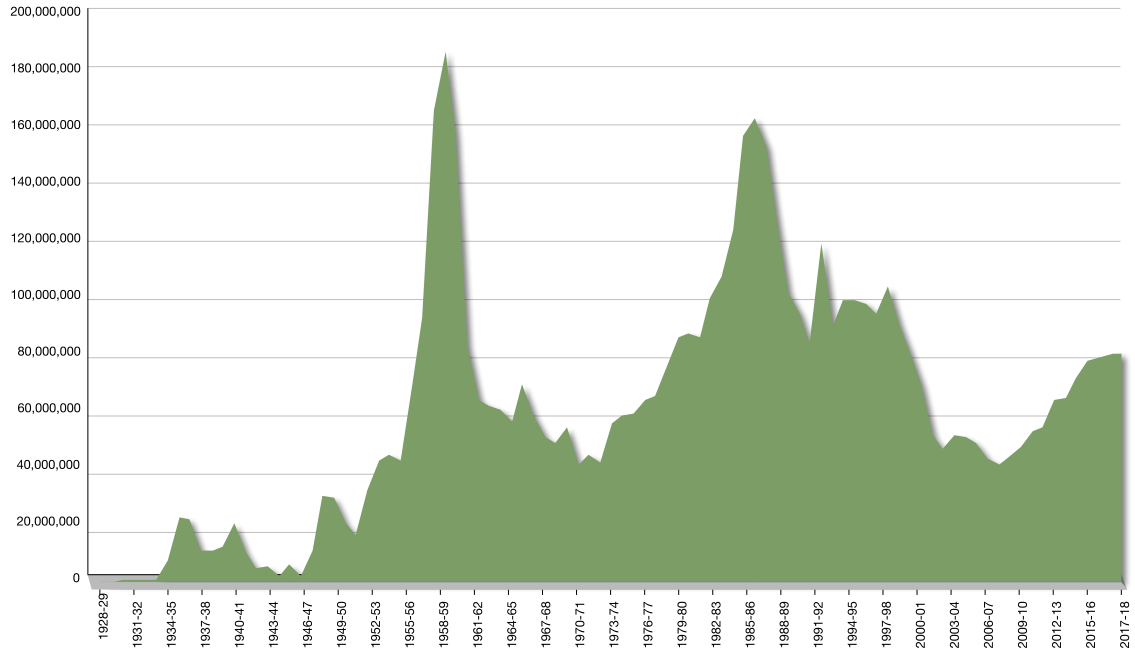
Overall, total live volume on timberland in South Carolina for 2018 was 26.1 billion cubic feet, which is the highest volume ever reported in the state. All live volume was split almost evenly between softwoods and hardwoods (13.7 billion and 12.4 billion respectively). This supply of timber is continues to increase. Net growth of all live softwood trees averaged 928.9 million cubic feet per year between 2013 and 2018. Softwood removals during that same period averaged only 726.1 million cubic feet per year.

Hardwoods during the same period averaged 333.1 million cubic feet per year. This growth was substantially more than the average hardwood removal of 229.1 million cubic feet per year reported for the period.

An abundance of standing timber inventory over the past 2 decades has resulted in historically low stumpage prices. Until recently, more timberland owners have opted to thin their woodlands and postpone the final harvests. However, in the last few years, final harvest acres have surpassed acres of timberland thinned. As final harvest acreage increased, so did the number of seedlings being planted. Tree planting data in South Carolina (Figure 4) clearly show the increase in seedlings being planted following the 40-year low in 2010.

Although the number of seedlings being planted is favorable, an issue that may affect the availability of timber for use by the forest products industry is the capacity of harvesting contractors. Current studies have shown that logging capacity has fallen to a level that will not be able to sustain manufacturing demands if they return to pre-recession levels (Lewis 2009). With the tightening of credit, many loggers have not been able to stay in business. In addition, lower market demand for finished goods coupled with landowners pulling stumpage off the market due to falling prices has resulted in inadequate markets to deliver wood and insufficient stumpage to harvest (WSRI 2008).

Figure 4. Seedlings planted in South Carolina, 1928-2018



Forestry Regulations

Forestry in South Carolina is subject to federal regulations such as air quality, water quality, and endangered species laws; state regulations related to prescribed burning and water quality; and county regulations such as tree protection ordinances, road use permits, smoke ordinances, and harvest notification requirements.

Many, if not all, of these well-intentioned laws and regulations restrict forest management activities, reduce land managers' options, and increase the cost of forest management (Hickman and Martus 1991) (Haney and Cleaves 1992). In many cases, forestry regulations can be a disincentive for forest landowners to actively manage their forests and may be an incentive to convert their forest land to another use.

Most regulations are premised on the theory that society has an interest in the conservation of forests and other natural resources. Federal and state regulations often are instigated by politically active interest groups that have various objectives that are unrelated to forestry. The Clean Air Act and the Clean Water Act were not directed at the forestry industry, but at local governments and manufacturing polluters.

The Endangered Species Act was passed in 1973 with the goal of protecting and recovering imperiled species and the ecosystems on which they depend. While the intention of this legislation is admirable, at times it restricts some management activities on private forestland. For example, timber harvesting may not be permitted during nesting season for red-cockaded woodpeckers. Each threatened or endangered species has its own set of regulations as well, so staying abreast of all of them may be burdensome for private landowners.

To ease some of these restrictions, Safe Harbor agreements are available in several states. The US Fish & Wildlife Service and the SC Department of Natural Resources have developed a Safe Harbor agreement for red-cockaded woodpecker management in South Carolina. Under this agreement, private landowners can enter into an agreement with SC DNR and will only be held responsible for a baseline number of RCW groups. The landowner agrees to carry out beneficial management practices for this species and in return is permitted to conduct certain activities like timber harvesting (Duncan et. al. 2001).

At the county level, regulations are often proposed in response to citizen concerns about clearcutting, muddy roads, noise, aesthetics, and other issues. State and local regulations also seek to protect public assets such as watersheds, wildlife, and roads and bridges (Seigel 1991) (Hickman and Martus 1991).

Local government planning commissions are sometimes not aware of the broad impact that their attempts to solve a local urban concern may have on forest landowners. For example, several counties in South Carolina have enacted tree protection ordinances to preserve trees during development. These laws were an attempt to prohibit developers from using an exemption for forestry operations that existed in earlier regulations. To tighten the regulations, however, lawmakers sometimes put an undue burden on forest land managers whose intent was to carry out legitimate forestry operations. An ordinance that was proposed in Charleston County, for example, required anyone who planned to harvest trees to conduct a detailed and costly survey of the property to ensure that the provisions of the tree protection ordinance were not violated. This type of ordinance could make timber harvesting and other proactive forest management activities prohibitively expensive and time-consuming.

Outdoor burning ordinances are another type of regulation that has the potential for negative effects on forest management. These ordinances were enacted in several counties in the state primarily to address nuisance smoke from yard debris burning. They also were designed to address air quality issues, especially in those areas where non-attainment[2] may be an issue. The SC Forestry Commission provides advice to counties considering such legislation to ensure that prescribed burning for forestry, wildlife, and agriculture purposes is excluded from these ordinances. Unlike yard debris burns, prescribed burning for land management is monitored and regulated through the Smoke Management Guidelines in cooperation with the SC Department of Health and Environmental Control (DHEC), and, therefore, takes into consideration atmospheric conditions. Since the trend is toward increasing regulation, the agency will need to continue to monitor outdoor burning ordinance proposals to ensure that forestry, wildlife, and agriculture burns are exempted from such ordinances.

South Carolina forest landowners realized the threat to forestry posed by local forestry regulations and worked with the SC Forestry Commission and other forestry groups to encourage the state legislature to pass the Right to Practice Forestry Act in 2009. This law prohibits counties and municipalities from enacting ordinances that "restrict or regulate certain forestry activities," thereby removing the burden of local regulations from those landowners who are

carrying out legitimate forestry practices. To help minimize the abuse of this law by developers, language was included that prohibits development of land for up to five years after a timber harvest.

In addition to promoting this type of legislation, the SC Forestry Commission often joins forces with advocates of forestry in South Carolina to educate lawmakers about the economic importance of forestry and agriculture in the state. For example, the Palmetto Agribusiness Council sponsored an assessment in 2015 on the impact of agribusiness. This assessment showed that forestry and farming combined is a $41.7 billion industry that supports 212,530 jobs (London, 2015). The Council has sent this report to state and local leaders to help them develop laws and regulations that help rather than hurt the forest products industry. Efforts of this nature raise awareness among lawmakers and are critically important. Joey Ferguson of Resource Management Services observed that "when sectors of the economy get positive attention, they tend to be protected…from harmful regulation."

Excessive property and income taxes can have the same negative effect on forest management as restrictive regulations. Fortunately, South Carolina's tax environment is friendly to forestry. Federal and state capital gains treatment of timber sale revenue and the ability to expense reforestation costs, for example, provide incentives for landowners to continue managing their forest land. South Carolina's property tax assessment is also pro-forestry in that it is based on either current use of the land or its relative productivity. Instead of a severance tax, South Carolina assesses a small tax on the forest products industry that is based on the amount of wood that is processed each year. This tax funds the $1 million Forest Renewal Program (FRP), which pairs the $800,000 that is collected from forest industry with $200,000 that is allocated by the General Assembly (SCFC 2020). Through this Forestry Commission-administered program, forest landowners are eligible for partial reimbursement for reforestation practices that they implement. Because FRP helps ensure a sustainable supply of wood, the forest products industry supported creation of this program.

As the population of the state becomes more urban, the citizens are likely to lose touch with the land and become less tolerant of forest management activities (see sections on population growth and public perceptions about forestry). Forestry advocates will need to remain diligent to ensure their voices are heard when federal, state, and local lawmakers propose restrictive regulatory and tax legislation.

Prescribed Fire

Prescribed fire, also known as prescribed burning or controlled burning, is fire applied in a skillful manner under exacting weather conditions in a definite place to achieve specific results. The long-valued historical, cultural, economic and ecological importance of prescribed fire in South Carolina cannot be overstated. Prescribed fire is an economical, practical, and desirable forest management practice that produces numerous benefits. Although multiple prescribed fire applications over numerous years may be necessary to fully achieve desired outcomes, a single prescribed fire provides many benefits (Waldrop and Goodrick, 2012).

Prescribed fire is the most pragmatic tool to reduce hazardous accumulations of forest fuels, thus reducing wildfire risk. Frequent prescribed fire contributes to long-term forest health by reducing hazardous fuel loads and excessive duff accumulation (Coates et al., 2017). Prescribed fire promotes greater forest ecosystem resilience to stressors like wildfire, insects and diseases, and climate change (Kalies and Yocom Kent, 2016). It is also a tool that perpetuates the diversity of conditions necessary for many game and non-game wildlife species and is critical for restoring and maintaining the habitat conditions required by certain at-risk wildlife species. Other prescribed fire benefits include:

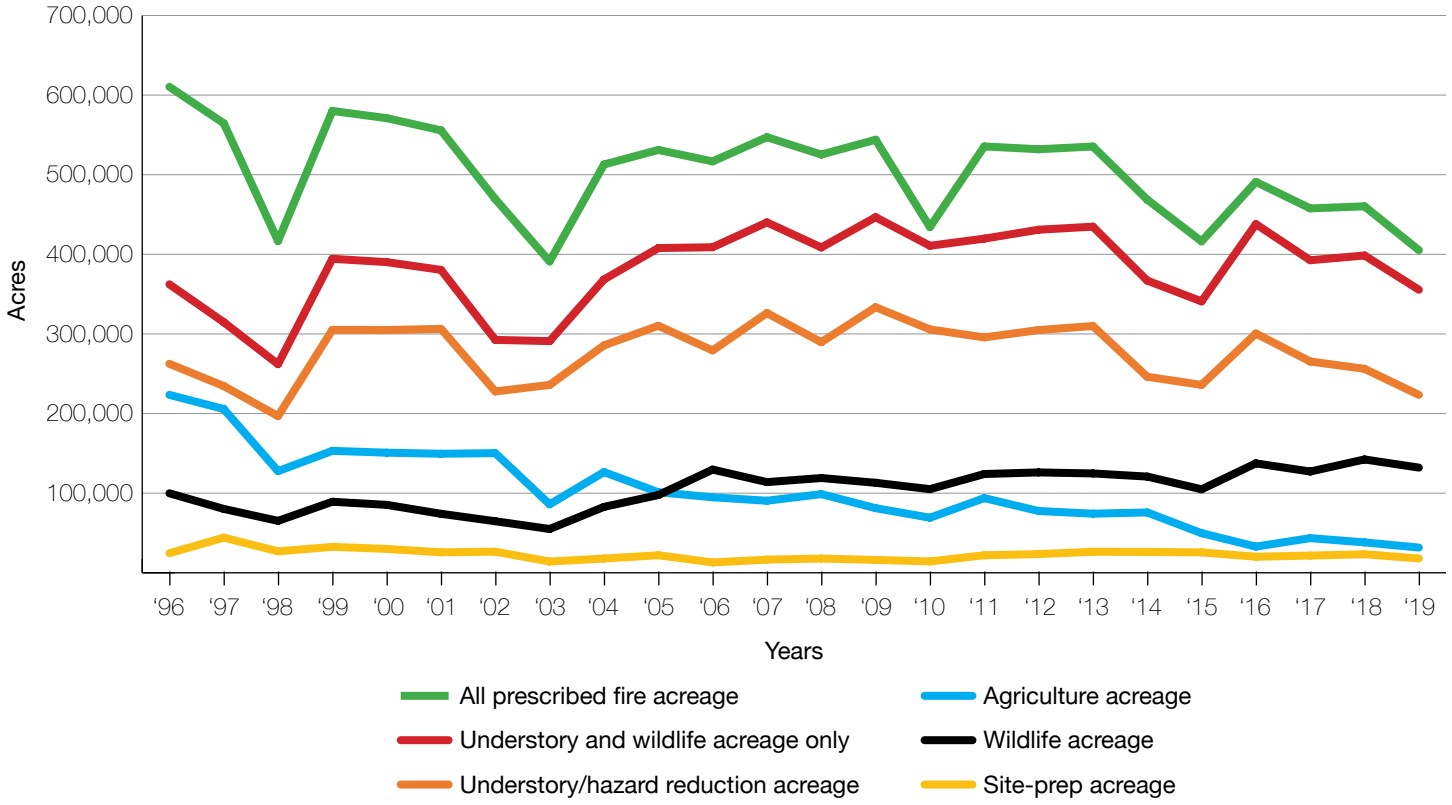
- Preparing seeding or planting sites
- Managing competing vegetation
- Recycling nutrients
- Improving groundcover
- Improving grazing forage
- Enhancing aesthetics and access

For millennia, fire has influenced, and continues to influence, the southern forest landscape as a major ecosystem process (Brennan et al., 1998). Natural fires were ignited by lightning, and then Native Americans began applying fire to manage the landscape for many of the

Figure 5. Prescribed fires and acres burned, by fiscal years

Fiscal year	Rx burns	Acres burned
2015	11,530	416,300
2016	10,574	491,000
2017	12,291	457,691
2018	11,651	460,279
2019	10,132	405,205
Totals	**56,178**	**2,230,475**

Figure 6. Prescribed fire acreage, by category



same reasons we do today. European settlers arriving in South Carolina displaced Native Americans, but witnessed and learned the advantage of using fire to shape their environment. Both Native Americans and settlers used fire to promote hunting and herding, control understory growth and stimulate forage and browse. Both plants and animals developed adaptations to tolerate and flourish the presence of frequent fire and many depend on habitat conditions created by fire (Waldrop and Goodrick, 2012).

During the late 19th and into the early 20th century, excessive logging and the attendant logging debris fueled wildfires. Systematic suppression of wildfires became normal policy for many agencies. Although fire was never completely removed from southern forests, use declined for several decades. The advent of modern prescribed fire arose from mid-20th century reports demonstrating the benefits of using fire to manage forests and promote wildlife habitat (Lafon et al., 2017; Waldrop and Goodrick, 2012).

Beginning in the 1980s, prescribed fire transitioned from a forest management tool employed commonly in the coastal plain to an accepted practice in the Southern Blue Ridge forests. Presently, private and public land managers across South Carolina use prescribed fire for a broad range of objectives. The complexities of South Carolina's landscape context (e.g., ownership patterns, land cover, land use) present a host of challenges to forest managers that wish to use prescribed fire. An emerging challenge, climate change, could bring additional complexities to the use of prescribed fire. Altered patterns and intensity of rainfall and drought may reduce or shift seasonal availability of the number of burn days available to fire managers (Mitchell et al,.2014).

In 2019, fire managers conducted 10,132 prescribed burns which treated a total of 405,205 acres (SCFC 2020). As evidenced by Chart XX below, the overall trend of acres burned in South Carolina is declining. Trend lines for wildlife and understory/hazard reduction prescribed fire categories demonstrate a slight but steady increase in the number of acres burned. A significant decline in agricultural burning affects the overall prescribed fire acreage decline (SCFC, 1996-2017).

The SC Forestry Commission estimates that 1.53 million acres should be burned each year in South Carolina to achieve landowner management goals (SCFC 2020). This estimate is based on carrying out prescribed burns on a 4-year rotation in pine and pine-hardwood stands that are old enough to be burned (>5 years) and on a 10-year rotation in Oak/Pine types. Land managers practicing prescribed fire face many challenges. These challenges must be addressed to achieve the goal of 1.53 million annual acres of prescribed fire in South Carolina.

Challenges to prescribed fire:

- Population growth and sprawl (see section on population growth)
- Fragmentation and parcelization of forest lands (see section on fragmentation and parcelization in the Conserving SC's Working Forests section)
- Changing public attitudes toward prescribed burning
- Reduction or seasonal shift in available burn days resulting from climate change
- Change in forest conditions and moisture levels due to climate change
- Decreased technical skills among private landowners and managers
- Decrease in available burn contractors due to perceived liability, cost of insurance, and expenses associated with burning
- More stringent air quality regulations
- Revised EPA regulations on ozone and particulate matter concentrations—see chapter on air quality in the Conserving South Carolina's Working Forests section
- Increased number of County burning ordinances such as those in the following counties: Lexington, Greenville, Lancaster, Anderson, York, and Georgetown
- Liability for damages as a result of fire and smoke (see https://fp.auburn.edu/fire/additionalsmokerealtedaccidents.htm)
- Reduced capacity to conduct prescribed burns among contractors and private land managers (personnel and equipment)
- Reduced capacity to conduct prescribed burns among state and federal agencies (personnel and equipment)
- Lack of accurate smoke prediction models
- Misconceptions about seasonality of prescribed fire and its effects on forests and wildlife

Impacts of static growth or decline in prescribed fire:

- Increased fuel buildup resulting in more destructive wildfires
- Decreased forest resilience to stressors (drought, storms, insects and diseases, wildfire)
- Decreased wildlife habitat for many species
- Disconnected species corridors
- Reduction of populations of fire-dependent plant and animal species
- Forest conditions that are less aesthetically pleasing to some
- Increases in invasive species

Land managers, public and private, devise and use innovative approaches that address prescribed fire challenges. Partnerships across the state have begun using Learn and Burn workshops to build technical skills among private landowners. Prescribed Burn Associations, essentially neighbor helping neighbor, provide a novel means of overcoming technical, personnel and equipment issues among private landowners. Both the Learn and Burn and Prescribed Burn Associations offer an opportunity to create mentoring relationships among private landowners. There has also been an increase in cost-share available to landowners for prescribed fire. Interagency partnerships provide a tremendous opportunity to innovate and in addressing prescribed fire challenges. Other potential means to overcome prescribed fire challenges:

- Provide basic, yet technical, prescribed fire training to NRCS Field Staff
- Use Shared Stewardship to apply prescribed fire across state, federal and private lands
- Seek funding for seasonal SCFC prescribed fire crews for private lands
- Develop interagency burn teams that assist multiple agency prescribed fire efforts
- Distribute state and federal cost-share funds for prescribed fire efficiently
- Require and provide Continuing Education credits for Certified Prescribed Fire Managers
- Develop and encourage methodologies for retaining prescribed fire contractors
- Provide hands-on education and outreach to landowners and prescribed fire managers

The SC Forestry Commission conducts prescribed burning on its own land, offers a turnkey prescribed burning service to private landowners, and encourages other land managers to conduct burns. The Forestry Commission offers a Certified Prescribed Fire Manager Program and is an active participant in the South Carolina Prescribed Fire Council (see www.scpfc.org). The Forestry Commission also participates in the One Message Many Voices Prescribed Fire Education Campaign. More information on this campaign is available at www.goodfires.org.

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Glossary

[1]Fuels – dead leaves, grasses, pine needles, and branches on the ground. Brush, shrubs, fallen logs, and sometimes even the trees themselves are also considered fuel.
(source: www.trees.sc.gov/refwild.htm#fuels)

[2]Wildland Urban Interface (WUI) – where homes and other human development meet or intermingle with undeveloped land.

Critical Habitats for Species and Diversity

Critical habitats are those that are necessary to maintain a species diversity. As part of its land protection strategy, the South Carolina Department of Natural Resources (SCDNR) strives to implement the "3 R's of Conservation:" increasing resiliency, redundancy, and representation across the landscape. Pine uplands, bottomland hardwoods, upland hardwoods, and shrubland/grasslands with their embedded microhabitats (e.g. isolated wetlands, mountain bogs, seeps, rock outcrops), beach and dune communities, maritime forests, and aquatic habitats are included in these holdings.

The SCDNR is guided by the South Carolina Wildlife Action Plan (SWAP) which is a statewide strategy to conserve populations of native wildlife species and the natural habitats they need in order to keep common species common and keep rare species from requiring listing. The SWAP is updated every 10 years. The most recent version (2015) lists 826 species (494 animals and 332 plants) of conservation concern across both terrestrial and aquatic systems. The SWAP highlights three important forest types relevant to the Forest Action Plan: 1) bottomland forests, 2) pine (also pine/oak) savannahs, and 3) maritime forests (SC DNR 2015).

Bottomland forests are important habitats for a variety of wildlife species, including neotropical migratory birds, waterfowl, crayfish, and game animals. This general habitat type includes linear or small-patch communities such as canebrakes, floodplain pools, and riparian forests including cypress/tupelo swamps all in the Coastal Plain and mountain draws in the Blue Ridge ecoregion.

The Nature Conservancy estimates that 52 million acres of bottomland hardwoods covered the Atlantic and Gulf Coastal Plains prior to European settlement. This acreage had been reduced to only 12 million 350 years later (DeBerry and Dunleavy 2007). Fragmentation and excessive logging in the past have greatly reduced the quality and quantity of this forest type. Fortunately, South Carolina has preserved some high-quality examples such as Francis Beidler Forest, Congaree National Park, and vast acreages in the Jocassee Gorges and the ACE Basin. Maintenance of mature, intact, and contiguous bottomland forests is important for the conservation of South Carolina's wildlife diversity in that it not only provides habitat for permanent residents, but also for birds migrating through that require stop-over habitat.

Most of the Piedmont and Coastal Plain were once covered by savannahs maintained by frequent fire. These

relatively open forests with widely spaced trees provided habitat for a number of important but declining species like grassland birds, pollinators, imperiled plants, and numerous priority amphibians and reptiles. The Northern Bobwhite (Colinus virginianus) serves as one example of a species in conservation need that is largely dependent on tree savanna restoration. South Carolina's bobwhite population has declined by over 70 percent since 1966. Establishing and maintaining high quality tree savannahs is a priority focus of bobwhite quail habitat restoration efforts. A 2019 report on Recent Trends in Southeastern Ecosystems (SECAS 2019) noted that grassland birds, including bobwhite quail, were the farthest behind in meeting goals set for the Southeast. It highlighted both the importance of maintaining progress in longleaf ecosystems and the importance of increased management in areas outside of the longleaf pine range.

In the Piedmont, shortleaf pine and oak savannahs once dominated the uplands. They were maintained by frequent fire and grazing by bison and elk. They also supported several culturally and ecologically important animals and plants like bobwhite quail, wild turkey, and the federally endangered Schweinitz's sunflower. Due to fire suppression and a lack of forest management, this once common ecosystem is now very rare. However, a broad coalition of non-profit, local, state, and federal government groups are now working throughout the Piedmont to bring back this ecosystem (Southeastern Grassland Initiative 2020). In addition, in 2016 the Shortleaf Pine Initiative (www.shortleafpine.net/) devised a strategy which aims to reverse a 50% decline in this imperiled ecosystem over the past 30 years through range-wide conservation.

In the Coastal Plain, longleaf pine forests once covered a vast range from Texas to Virginia but have been reduced to only three percent of the historical acreage due to conversion to other land uses and forest types. Longleaf pine is often associated with pine savannahs. Fire was an essential component of the ecosystem as it kept the understory clear and is required by some species in order to persist such as the Sandhills lily (Lilium pyrophilum) and pond pine (Pinus serotine). Longleaf pine forests have been ranked as the third most endangered ecosystem in the United States (Noss et al 1995). South Carolina's SWAP identifies several plant and animal species associated with pine savannas that are threatened or are species of concern.

Restoration of the pine savannah habitat type, especially the longleaf pine savanna, is a high priority in a variety of conservation plans developed by federal, state and non-governmental conservation organizations. Examples include: America's Longleaf Initiative; North American Wild Turkey Management Plan (NAWTMP); Northern Bobwhite Conservation Initiative (NBCI); the SC SWAP; Partners in Flight North American Landbird Conservation Plan; and Partners in Amphibian and Reptile Conservation's Habitat Management Guidelines for Amphibians and Reptiles of the Southeastern United States.

Longleaf pine forests are highly valued for their resistance to damage by insects, diseases, wildfire, and storms, and for their yield of high-quality wood products, biological diversity, and beauty. This ecosystem is so significant that a group of conservationists assembled in 2005 and developed a 15-year plan designed to increase the acreage of longleaf pine across the South from 3.4 million to 8 million (America's Longleaf 2009). As of 2018, this partnership has reversed the decline and increased longleaf acres on public and private land from 3.2 million acres to 4.7 million acres.

Maritime forests are another high-priority forest type found in South Carolina's Coastal Zone. Consisting of sabal palmetto, live oak, water oak, yaupon, red bay, and southern magnolia, this forest community often harbors several species of concern. Maritime forests and their associated shrub edges are unfortunately prime real estate and under threat from development. South Carolina needs its maritime forests, hummock (barrier) islands, marshes, and dune systems; not only for the habitats they provide, but also for the protection they afford coastal communities during hurricanes. Such habitats absorb wind and wave action as well as flood events and often buffer coastal communities directly inland from them. The SCDNR has produced a manual for coastal communities titled, "Best Management Practices for Wildlife in Maritime Forest Developments." This guide can be utilized during the planning and construction phases of development projects to minimize and mitigate the negative effects of coastal development on SWAP priority species (SCDNR 2007).

Connecting these and other critical habitats across the landscape is also important. In 2018, the Southeast Association of Fish and Wildlife Agencies (SEAFWA) adopted a goal of a 10% or greater increase in the health, function, and connectivity of Southeastern Ecosystems by 2060. This is part of a larger partnership called the Southeast Conservation Adaptation Strategy (SECAS). The partnership has developed a Conservation Blueprint for the Southeast (http://secassoutheast.org/blueprint), mapping important habitat and connections across the Southeast

U.S. This Blueprint has already been used at the state level by the South Carolina Conservation Bank, the Nature Conservancy, South Carolina Department of Natural Resources, and at least one member of the forest products industry.

Large landscape, multi-owner partnerships and conservation efforts provide a means to restore critical habitats and increase populations of declining wildlife. For example, the Indian Creek Wildlife Habitat Restoration Initiative has been very successful in obtaining cost-share assistance for private landowners as well as technical assistance in establishing management practices. The combination of USDA Forest Service Stewardship Contracting and Agreement Authorities, the Wyden Amendment, and USDA Farm Bill programs were instrumental in this excellent example of multi-partner collaboration. The project began with only 16,000 acres in conservation, but by 2018 had expanded to over 40,000 acres and has seen a positive response in quail numbers (162% increase in fall covey counts and 75% increase in whistling cock surveys since 2005). It is hoped that more initiatives like this can conserve more critical habitats and connecting corridors across the State of South Carolina.

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Glossary

[1]timberland – forestland capable of producing 20 cubic feet of industrial wood per acre per year and not withdrawn from timber utilization

[2]non-attainment area – an area where the amount of ground-level ozone exceeds the EPA standard of 0.075 parts per million

Priority Areas

See Appendix 2.

PROTECTING SOUTH CAROLINA'S FORESTS FROM HARM

This section addresses issues such as wildfire risk, forest pathogens, invasive species, and forest pests that threaten the health of South Carolina's forests.

Wildfire Risk

The South Carolina Forestry Commission is responsible for protecting 13,657,033 acres of forest land in South Carolina from wildfire. This total area protected is based on the 2006 Forest Inventory Analysis data with 10 percent added to cover adjacent non-forest land. This figure includes 101,320 acres of federal land protected under special contract, such as the Carolina Sandhills National Wildlife Refuge and the Corps of Engineers land around Lake Thurmond, Lake Hartwell, and Lake Russell. Also included is forest land protected by Mutual Aid, which is approximately 824,801 acres of additional federal land, such as the Francis Marion and Sumter National Forests, National Park lands, and lands owned by the US Fish and Wildlife Service (SCFC 2020).

South Carolina has a large percentage of land that contains fuels[1] that are highly flammable. These fuels ignite easily and burn with high intensity when the relative humidity is low, and winds are high. These weather conditions occur many times during the year.

The five-year fire occurrence average from 2015 through 2019 was 1,418 wildfires that burned 10,598.5 acres annually. The average fire size was 7.5 acres.

In Fiscal Year 2018-19 wildfires destroyed 12 homes and damaged eight additional homes. In addition, 39 other buildings were destroyed, and 21 buildings were damaged. Agency firefighters saved 424 structures that were directly threatened by wildfires. Below is a summary of wildfire damage during the past five years (see Table 2).

The number of homes and buildings damaged or destroyed by wildfire is increasing because of the rising number of wildland urban interface (WUI)[2] areas. The conversion of forest land to residential development has also increased wildfire risk in many areas of the state.

To combat this trend, the SC Forestry Commission actively promotes the FireWise Program (www.firewise.org) throughout the state (SCFC 2020). This national initiative encourages homeowners and developers to make neighborhoods more resistant to wildfire through practices such as the use of less flammable landscaping, trimming lower limbs on yard trees, and removal of flammable material from roofs and under decks. Thirty-five communities across the state have been recognized as FireWise Communities/USA.

The Forestry Commission also develops Community Wildfire Protection Plans (CWPPs) in partnership with local fire departments (see www.trees.sc.gov/nfpacc.htm).

SCFC 2020-2030 Strategic Plan

The SCFC's strategic plan commits the agency to protection on all fronts.

GOAL: Protect Forests from Harm

Strategy 1 – Ensure prompt and effective response to wildfires and other disasters in an increasingly complex environment.

Strategy 2 – Develop and deliver innovative prevention programs that reduce wildfire risks to forests and communities.

Strategy 3 – Deliver law enforcement services to reduce wildfire risks, illegal dumping, and forest product theft and fraud.

Strategy 4 – Deliver programs and services to prevent and reduce damage from insects, diseases, invasive species, and other threats to our forests.

Figure 7. Statewide wildfire risk

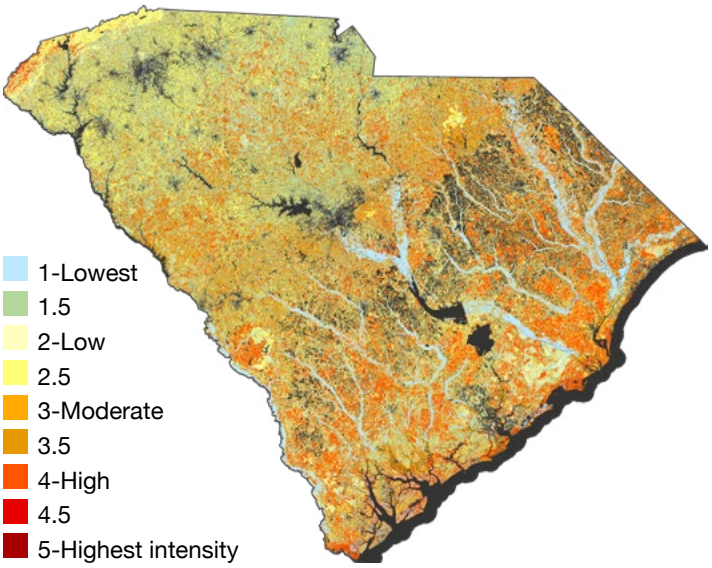

Figure 8. Property damaged or destroyed by wildfires, FY2015-19

Cause	Fires	Acres burned	Average acres	Percent of total	Structures saved
2019	12	39	8	21	116
2018	23	61	17	28	954
2017	27	71	24	33	1,895
2016	6	28	9	7	141
2015	10	34	14	35	734
5-year average	**15**	**47**	**14**	**25**	**768**

Through this proactive approach, the agency works with homeowner associations, fire departments, and other organizations to write plans that, when implemented, will reduce the number of homes damaged or lost to wildfire. Initially, SCFC field personnel developed CWPPs for communities in high risk areas, based on the history of wildfire occurrence and local knowledge of risk factors (bay fuels, complex WUI, and lack of infrastructure). When it was developed, plans were completed in 219 communities with high or moderate risk, as identified by the Southern Wildfire Risk Assessment.

The two largest causes of wildfires in South Carolina are escaped debris burns (54.5 percent in 2019) and incendiary (14 percent in 2019). These causes are consistent over time as evidenced by the following data (see Table 3).

As the data above show, the vast majority of wildfires are human caused. Consequently, the SC Forestry Commission actively promotes fire prevention through its "Think Before You Burn Campaign" (see www.trees.sc.gov/think) and by vigorous enforcement of state fire laws. Wildfire prevention efforts have been implemented to help increase the public's awareness about outdoor burning, especially with regard to escaped debris burns. These prevention efforts highlight the proper way to conduct such burns in a safe manner. The "Think Before You Burn Campaign" has resulted in a slight decrease in the percentage of debris burns over the last five years. A significant element of the agency's wildfire prevention program is the prosecution of burning law violations. South Carolina Forestry Commission law enforcement officers investigate wildfires of suspicious origin and regularly make cases under the Notification and Precautions Law and other statutes. The five-year average (2015-2019) for the number of fire investigations conducted is 1,417.

The peak fire season in South Carolina is February through April, but wildfires occur in all months of the year (see Table 4).

As shown by the map below, wildfires occur most often in the Coastal Plain and Sandhills portion of the state, but do occur in every county of the state. Some areas historically have high fire occurrence because of a high concentration of flammable fuels. In addition, long-time residents in the Coastal Plain of South Carolina have a tradition of using fire for land and wildlife management purposes.

Topography presents challenges for wildfire suppression in many parts of the state. In the mountains and foothills, steep terrain makes access difficult and contributes to high rates of spread, since fires generally move more quickly up slopes than on flat ground. Much of the Piedmont of South Carolina is plagued with deep gullies which can be troublesome for foot travel as well as for equipment. In addition, the soils below forested vegetation in low-lying areas in the Coastal Plain are often wet, causing firefighting equipment to get stuck; thereby, hindering suppression efforts. The agency addresses these challenges by providing specialized training for firefighting personnel and providing equipment adapted to these areas.

To fight these wildfires, the SC Forestry Commission maintains approximately 160 tractor plow units and 50 trucks outfitted with water handling equipment. Since 2012, the agency has been receiving funds through

Figure 9. Wildfires, by cause, FY2015-19

Cause	Fires	Acres burned	Average acres	Percent of total
Lightning	205	2478.6	12.1	2.89
Campfire	91	10992.1	120.8	1.28
Smoking	131	431.2	3.3	1.85
Debris burning	3,553	19,943.4	5.6	50.11
Incendiary	1,168	9,643.2	8.3	16.48
Equipment use	456	2883	6.3	6.43
Railroad	69	432.9	6.3	0.97
Children	251	689.9	2.7	3.54
Miscellaneous	653	3,738.9	5.7	9.21
Fireworks	62	121.1	2.0	0.87
Power line	286	1,256.7	4.4	4.03
Structure	164	381.6	2.3	2.31
Totals	**7,089**	**52,992.6**	**7.5**	**100**

insurance premium taxes and state appropriated funds, and has made significant progress in acquiring environmental cab firefighting dozers and increasing the percentage of dozers that are within the desired 15-year replacement cycle for these units. As of 2020, 64% of frontline firefighting units were equipped with enclosed cabs to provide greater protection for the firefighters, and 79% of all frontline units were less than 15 years old.

The consolidation of forest industry, coupled with transfer of forest industry land to Timber Investment Management Organizations (TIMOs) and Real Estate Investment Trusts (REITs), has decreased the number of acres treated with prescribed fire. These new owners have neither the personnel nor the technical expertise to continue the prescribed burning regime that the forest industry had established. To help fill this void, these landowners now rely on the SC Forestry Commission's prescribed burning services. The agency has been very successful in rebuilding capacity, including firefighters and more reliable firefighting equipment in the last few years, but capacity to meet the demand for prescribed burning and other services is still less than needed.

Priority areas for fire prevention, suppression, and FireWise education efforts are in the areas of highest fire occurrence, areas of large fires, and communities at risk. These areas are indicated in the Priority Area Maps in Appendix 2.

Threats to Forest Health

Introduction

The health and productivity of South Carolina's forests have historically been threatened by insects, diseases, plants, and abiotic stressors, such as flooding and drought. These threats can cause significant economic and ecological damage, such as tree mortality, loss of tree growth, tree deformity or other reduction of quality, loss of native species, loss of species diversity, or a change in forest composition. Often, native insects cause damage on a cyclical basis and losses can increase through improper forest management practices, such as planting species off site, or lack of active forest management. Abiotic stressors, such as drought, floods, lightning, ice storms, or hurricanes, can increase the populations of many native pests. Pests can also spread following activities like prescribed fire, wildfire, poor forest management, soil compaction, thinning and/or timber harvesting. Non-native pests have been released from the predators, pathogens, and parasitoids that have kept their populations below the threshold where they cause damage in their native habitat. Furthermore, South Carolina's native trees lack the defenses and adaptations to these novel pests.

The threats to the health of forests in South Carolina include native, non-native but naturalized, and non-native plants, diseases, and insects. Some threats are not yet present in South Carolina but may exist in adjacent states or have the ability to spread or be moved long distances via humans. These threats require surveys to determine their existence in South Carolina. Once discovered in South Carolina, these pests will require a rapid response for eradication or containment. This process of survey and response is termed Early Detection Rapid Response (EDRR).

Other categories of threats that exist in the state have been labeled Major Threats, Moderate Threats, or Low Threats. The primary focus in South Carolina is on the threats that are considered Major Threats or are on the horizon and require EDRR. Moderate and Low Threats are briefly mentioned, but these threats will likely cause little damage or cause damage only on a cyclical basis. They also may be native, naturalized, geographically restricted, or so geographically widespread that control or containment is not feasible or warranted at this time.

The threats discussed in this assessment are not the only potential threats to forests in South Carolina. Increased trade and shipment of goods from foreign countries and travel opens the US and South Carolina to an increasing number of threats.

The most significant threats to South Carolina's forests currently are southern pine beetle, *Ips* engraver beetles, hemlock woolly adelgid, emerald ash borer, Callery pear and cogongrass. They are important because of their potential economic, aesthetic, and ecological impact on South Carolina's forests.

Ips engraver beetles

[Ips avulsus (Eichhoff), I. grandicollis (Eichhoff), and I. calligrapha (Germar)]

Ips engraver beetles include three native species in the southeastern US: *Ips avulsus*, *I. grandicollis*, and *I. calligrapha*. Historically *Ips* beetles have been cyclical or secondary pests of southern pines, causing limited damage most years. *Ips* beetles respond to trees damaged or weakened by drought, wildfire, wind, lightning strikes, and to trees being suppressed or diseased. Unlike southern pine beetles, they can continue to breed in downed timber and slash left by harvesting operations or wind damage. Recent oscillations

of wet winters and dry summers have resulted in larger than normal *Ips* outbreaks in 2016, 2018, and 2019. In these outbreak years we have seen spots more than an acre in size develop around wood mills as infested wood from other parts of the state is concentrated at these focal points. Also, unlike southern pine beetle, which is not active when temperatures increase above 92.5 oC, *Ips* beetles continue to be active at higher temperatures.

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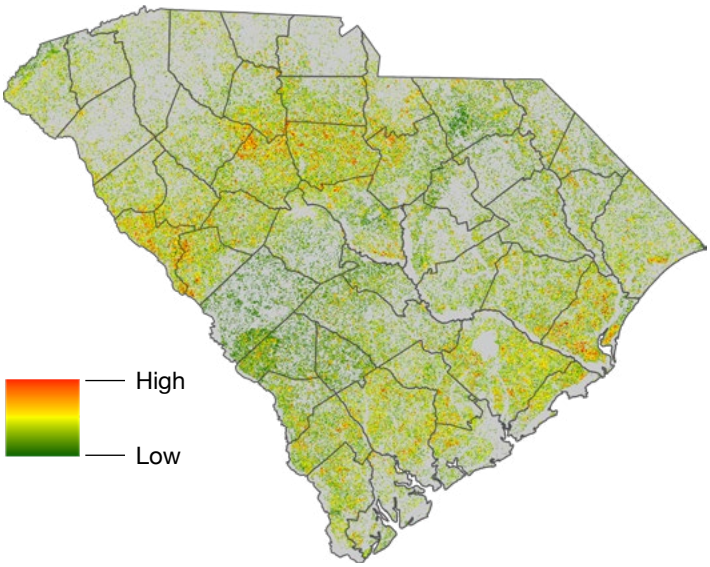
Southern Pine Beetle

(Dendroctonus frontalis Zimmerman)

The native southern pine beetle (SPB) is one of the most destructive insects in the southern United States. Southern pine beetle outbreaks historically occurred every 5 to 7 years in trees that were weakened due to drought, overstocking, and other stresses. Preferred hosts are shortleaf, loblolly, Virginia, and pitch pines, though they will attack longleaf, white and slash pines. Southern pine beetle has impacted pine forests throughout South Carolina, although activity has historically been low in Aiken, Barnwell, Allendale, Bamberg, Orangeburg, Calhoun, Sumter, Clarendon, Lee, Darlington, Florence, Marion, Dillon, Marlboro, and Chesterfield counties. The southern pine beetle often introduces blue-stain and other fungi into trees. These fungi block the movement of water in the tree, causing the tree to die. Outbreaks have been responsible for millions of dollars of tree loss in South Carolina. The last outbreak occurred from 1998 to 2002. Populations of SPB have been declining since this outbreak, with only moderate increases in the last two years. During the past decade, outbreaks of SPB in the southeastern U.S. have been largely restricted to unmanaged/unthinned stands. Native predators, such as clerid beetles, and active forest management, including reducing stress on trees through on-time thinning, low density planting, and prescribed burning, have proven successful in reducing the impact of SPB. The South Carolina Forestry Commission administers a SPB prevention and restoration cost-share program. Approved practices include thinning young stands to help reduce SPB susceptibility, planting less susceptible species such as longleaf pine, planting non-susceptible species (hardwoods), and planting pines at low stocking levels (less than 500 trees per acre). Control of outbreaks includes salvaging affected stands or cutting and leaving affected trees and a small buffer to prevent spread. In addition, the South Carolina Forestry Commission administers the most intensive SPB trapping program in the country each spring. The results of this program allow us to accurately predict the counties most likely to experience an outbreak of SPB and focus our survey and management efforts in these counties.

Figure 10. Southern pine beetle occurrence



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www.fs.fed.us/research/invasive-species/insects/southern-pine-beetle.php

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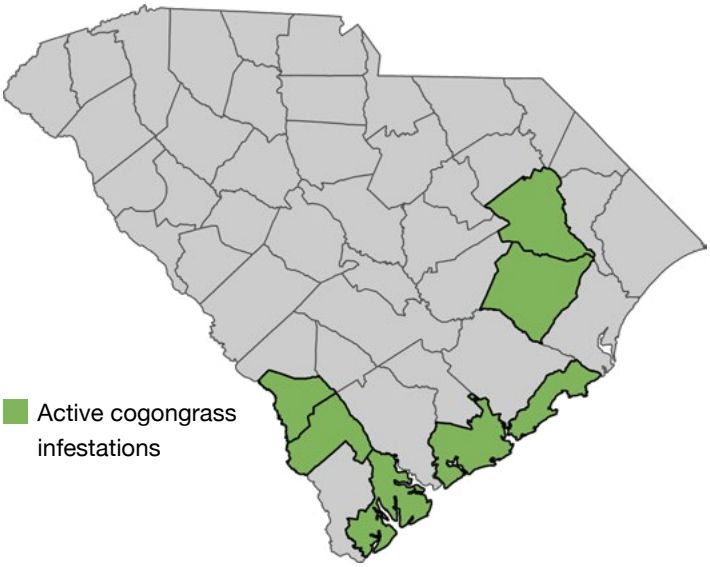
Cogongrass

(Imperata cylindrica)

Cogongrass is an aggressive nonnative clumping grass species that forms dense stands over large areas and chokes out native plants. The seeds are wind dispersed and each plant is reported to produce 30,000 seeds per seed head. Although cogongrass seeds in South Carolina have not been found to be viable, this could change as new varieties arrive and as the region warms. Cogongrass primarily spreads in South Carolina by rhizomes that can increase tenfold each year, growing out in a circular pattern. This species is highly flammable and changes the fire ecology of a site. Prescribed burns or wildfires in infested stands can burn hot enough to kill trees, opening the canopy and releasing cogongrass. Cogongrass first arrived in the United States in 1911 near Mobile, AL as packing material. In the 1920s this grass was planted in Alabama, Florida, and Mississippi as livestock forage. By the 1970s tens of thousands of acres were infested across the South, including Florida, which has almost one million acres of cogongrass. As of the 2019 Cogongrass Survey, viable populations of cogongrass have been found and are being treated in Aiken, Allendale, Beaufort, Charleston, Colleton, Florence, Hampton, Jasper, and Williamsburg counties. The widespread nature of this invasive in warmer regions just south of South Carolina

Figure 11. Cogongrass infestations



suggest that cogongrass could grow as a threat as the climate warms. Cultivars include Red Baron and Japanese Blood Grass. Both are banned from being sold in South Carolina. This plant is a federal noxious weed.

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The remainder of the Forest Health section is organized as follows:

Additional insect, plant and disease threats imperil the health of South Carolina's forests. Each threat, and the significance of the threat, are addressed in the following sections.

Insects

CATEGORY: EARLY DETECTION RAPID RESPONSE

Asian Longhorned Beetle

Anoplophora glabripennis **(Motschulsky)**

Asian longhorned beetle (ALB) is a large wood-boring beetle one to one and a half inches long which attacks many hardwood tree species, including but not limited to maple, elm, willow, birch, true poplars, ash, horsechestnut, and hackberry. Larvae feed on vascular tissue, weakening and killing trees. First detected in Brooklyn, New York in 1996, ALB spread to Long Island, Queens, and Manhattan. It was also found near Chicago, in New Jersey, and in Worcester, Massachusetts. Currently it is limited to small areas of New York City, Worcester, Massachusetts, south of Columbus Ohio, and, as of June 2020, in Hollywood, South Carolina. This beetle could become one of the most destructive and costly invasive species ever to enter the United States. This invasive insect threatens urban and suburban shade trees, recreational and forest resources, maple syrup production, nurseries and tourism. The USDA has worked with states with known ALB infestations to eradicate this pest and it has eradicated from Illinois, New Jersey, Canada, and parts of New York and Massachusetts.

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www.trees.sc.gov/pubs/invasivespecies.pdf

European Gypsy Moth/Asian Gypsy Moth

[(Lymantria dispar dispar **(L.) and** L. dispar asiatica **Vnukovskij)]**

The European gypsy moth was intentionally introduced in Massachusetts in 1869 and was discovered to be a highly destructive pest of trees. Larvae feed in large numbers on over 500 species of trees and shrubs and constitute one of the most destructive defoliators of both hardwood and softwood trees. The European gypsy moth is established in Wisconsin, Michigan, and the entire Northeast, as far south as North Carolina. Asian gypsy moth is not known to be established in the United States, but it has been periodically detected in Washington State, Oregon, Oklahoma, Georgia, and South Carolina. Temperate hardwood growing areas are at risk from both European and Asian gypsy moths. There has been a very successful federal gypsy moth management program that monitors and treats infested areas, focusing on the advancing edge of the range. This is the only reason South Carolina currently does not have an established population of gypsy moth. Gypsy moth defoliation causes tree mortality, reduces property values, adversely affects commerce, and creates health problems for sensitive individuals who may come in contact with the caterpillars. Asian gypsy moth is considered to be a major threat to United States forests. This species has a broader host range than European gypsy moth which includes some evergreens. The female Asian gypsy moth is an active flyer with a range of up to 25 miles. The female European gypsy moth cannot fly when she is gravid with eggs. Nonetheless, the egg masses of both of these moths can travel long distances on firewood, campers, coolers and other items moved by humans. An important Asian gypsy moth pathway is via ships and cargo from the Far East.

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www.trees.sc.gov/pubs/invasivespecies.pdf

Spotted Lanternfly

Lycorma delicatula **(White)**

Spotted lanternfly is a colorful planthopper native to China, India and Vietnam. In 2006 it was reported in South Korea where it became a pest of fruit crops, particularly grapes. In 2014 it was first detected in North America in Pennsylvania. Since then it has spread to New Jersey, Delaware, Maryland and Virginia. In Pennsylvania it is a pest of a variety of fruit crops, especially grapes, as well as a nuisance to homeowners due to its overwhelming populations and heavy production of honeydew (sugary excretions) and resulting sooty mold on surrounding vegetation. It is unclear to what extent this insect will become a pest in South Carolina's forests. It feeds on a variety of hardwood trees, typically species with thin bark, such as maple and beech, but it is not known what damage it causes as a result of this feeding. The adults and older nymphs are particularly attracted to the invasive plant tree of heaven. Although the adults are not efficient fliers, this pest can easily and rapidly be spread by humans. Egg masses can be glued to cars, trains, firewood and any number of items left outdoors. Management currently includes but is not limited to removing tree of heaven or leaving only male tree of heaven plants and treating these with systemic insecticides.

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CATEGORY: MAJOR THREATS

Southern Pine Beetle

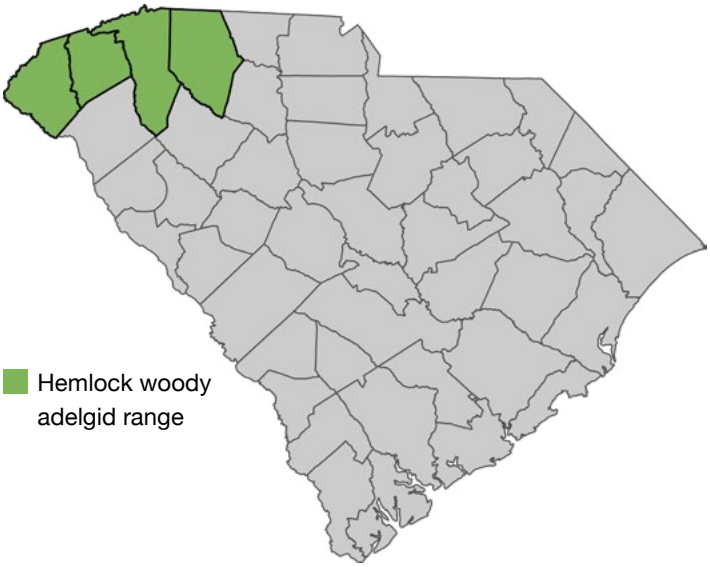
See description near the beginning of this section.

Hemlock Woolly Adelgid

Adelges tsugae (Annand)

Native to Japan, hemlock woolly adelgid (HWA) is an exotic destructive pest of eastern and Carolina hemlock trees. This species was first detected in South Carolina in 2001. Since that time, HWA has been detected in all South Carolina counties with hemlock trees (Oconee, Pickens, Greenville, and Spartanburg counties). The insect feeds from fall through spring at the base of needles, causing them to desiccate, and inhibiting new growth. Tree death can occur within a few years of being infested, although trees have survived 10 or more years with HWA infestation. Hemlock trees are an ecologically important component to forest and riparian habitats. These trees provide cover and forage for mammals and birds. Hemlocks provide shade for streams, promoting aquatic organisms, such as trout, insects, and salamanders. In addition, they provide shade for recreational activities such as hiking, biking, and camping. The loss of hemlocks due to this invasive insect has been devastating to the forested riparian ecosystems. Dead hemlocks increase the fuel loads in South Carolina's mountain forests. Control of HWA has been via systemic insecticides in urban areas, forest trees of high aesthetic, ecological, or historical significance, and recreation areas at state parks.

Figure 12. Hemlock woody adelgid infestations



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www.trees.sc.gov/pubs/invasivespecies.pdf

Emerald Ash Borer

Agrilus planipennis (Fairemaire)

Emerald ash borer (EAB) is an introduced insect pest of Fraxinus spp. This insect was detected near Detroit in 2002 but is thought to have been there at least five years prior. Since then EAB has moved rapidly, killing ash by the tens of millions. Emerald ash borer has been detected in 35 states (AL, AR, CO, CT, DE, GA, IA, IL, IN, KS, KY, LA, MD, ME, MI, MN, MO, NC, NE, NJ, NH, NY, OH, OK, PN, RI, SC, SD, TN, TX, VA, VT, WA DC, WI and WV). The EAB is a very aggressive killer of ash trees native to North America. Emerald ash borer changes the forest ecology and affects wildlife, causing billions of dollars in loss. Although ash comprises less than 1% of South Carolina's forests, it is a major component of hardwood river bottoms in the state and its removal by the EAB will release invasive plants, such as privets. This pest has no known natural enemies in the U.S., and consequently no effective control options currently exist on the scale that is needed.

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Redbay Ambrosia Beetle

See description of laurel wilt disease.

CATEGORY: MODERATE THREATS

Black Turpentine Beetle
Nantucket Pine Tip Moth
Pales/Reproduction Weevil
Pine Sawflies

CATEGORY: LOW THREATS

Black Twig Borer
Cactus Moth
Eastern Tent Caterpillar
Fall Webworm
Forest Tent Caterpillar
Locust Leafminer

Plants

CATEGORY: EARLY DETECTION RAPID RESPONSE

No current threats exist in this category.

CATEGORY: MAJOR THREATS

Cogongrass

See description near the beginning of this section.

Chinese Tallow

(Triadaca sebifera)

Chinese tallow was introduced to South Carolina in the late 1700s and has spread south to Florida and west to California. This tree was primarily cultivated as a seed oil crop and used for fuel, candle making, and soap. It is well adapted to a variety of habitats and soil types and appears to thrive with site disturbance. Currently, tallow is found in Aiken, Chesterfield, Calhoun, Clarendon, Horry, Georgetown, Florence, Bamberg, Charleston, Dorchester, Colleton, Jasper, Beaufort, Berkeley, Hampton, Williamsburg, York, Lexington, and Allendale Counties. Tallow spreads quickly and displaces native vegetation. This tree is unattractive to all types of wildlife because the plant sap and berries are extremely toxic. It also excretes toxins that change the soil chemistry around the tree and discourages any native species plant growth. This tree is especially troublesome in waterways and bottomland hardwoods. Chinese tallow is considered a severe threat by the South Carolina Exotic Plant Pest Council.

Range map

www.invasiveplantatlas.org/subject.html?sub=3079

Website

www.invasiveplantatlas.org/subject.html?sub=3079

www.trees.sc.gov/pubs/invasivespecies.pdf

Japanese Honeysuckle
(Lonicera japonica)

Japanese honeysuckle is the most commonly occurring invasive plant in South Carolina forests. This plant is an evergreen woody vine that typically grows up to 80 feet long. The white or yellow flowers are tubular and fragrant. This plant is spread by rooting at vine nodes and dispersed by animals spreading seeds. Introduced from Japan in the early 1800s, it is widely used and planted as deer browse. Japanese honeysuckle occurs across the southern United States, from California to New England and the Great Lakes region. Escaped populations also occur in Hawaii. Japanese honeysuckle has few natural enemies and forms dense infestations and arbors in forest canopies which can kill plants by not allowing them access to sunlight. This plant can also creep along the ground smothering large areas of native ground cover. Japanese honeysuckle is considered a severe threat by the South Carolina Exotic Pest Plant Council.

Range map
www.invasiveplantatlas.org/subject.html?sub=3039

Reference/Website
www.invasivespeciesinfo.gov/plants/honeysuckle.shtml

www.trees.sc.gov/pubs/invasivespecies.pdf

Japanese Stiltgrass, Nepalese Browntop
(Microstegium vinimeum)

Microstegium is an annual grass with a sprawling habit. This grass germinates in spring and grows slowly through the summer months, ultimately reaching heights of 2 to 3½ feet. The leaves are pale green, lance-shaped, asymmetrical, one to three inches long and have a distinctive shiny midrib. Flowers are produced in late summer (August to early October) and dry fruits are produced soon afterwards. This grass can produce up to 1,000 seeds per plant per year and the seeds can stay viable in the soil for multiple years. *Microstegium* threatens native plants and natural habitats in open, shady, and moist or dry locations. When this species spreads, it forms large patches, displacing and outcompeting native species. Native herbivores avoid eating this grass; goats can be made to eat it if it is sprayed with a sugar solution. This plant is found in all counties west of Calhoun County and in Berkeley, Charleston and Colleton counties. This species may impact other plants by changing soil chemistry and shading other plants. Soil disturbance increases the rate of spread. The South Carolina Exotic Plant Pest Council considers this species a severe threat.

Range map
www.invasiveplantatlas.org/subject.html?sub=3051

References/Websites
http://www.nps.gov/plants/alien/fact/mivi1.htm

www.invasive.org/species/subject.cfm?sub=3051

www.trees.sc.gov/pubs/invasivespecies.pdf

Privet
(Ligustrum japonicum, L. sinense, L. lucidum)

There are currently three *Ligustrum* species that are widespread in South Carolina. These plants are woody stemmed, evergreen shrubs that can grow up to 20 feet in height. The trunks are usually multi-stemmed. Flowering is extremely abundant with white flowers appearing on the ends of the branches. Each cluster of flowers produces numerous dark purple fruits that readily germinate in a variety of soil conditions and are easily spread by birds and other wildlife. Chinese privet (*L. sinense*) has small leaves around one inch in length. Japanese privet (*L. japonicum*) and glossy privet (*L. lucidum*) leaves can be three inches in length with glossy privet having slightly larger (up to six inches) shiny leaves. Privet was introduced through the landscaping industry for use as hedging due to its hardiness and ease of care. This shrub is highly aggressive, often displacing native vegetation in a matter of a few years. Privet can be especially damaging and prolific along streams and bottomlands.

Range maps
www.invasive.org/weedus/subject.html?sub=3034#maps

www.invasive.org/weedus/subject.html?sub=3035#maps

References/Websites
www.invasive.org/species/subject.cfm?sub=3035

www.duke.edu/~cwcook/trees/lija.html

www.trees.sc.gov/pubs/invasivespecies.pdf

Chinese Wisteria

(Wisteria sinensis)

Chinese wisteria is a deciduous woody vine that can grow up to 40 feet in height with single stems growing up to 10 inches in width. This vine was first planted in 1816 as an ornamental plant and has become naturalized since this time and is widely sold by the nursery industry because of the fragrant and showy inflorescences. Primary means of reproduction is by vegetative spread, but it can spread by seed. Wisteria is found extensively throughout central and eastern South Carolina. This plant is especially troublesome because it is long-lived (50 years), an aggressive grower, displaces native vegetation, and kills trees by girdling. Wisteria changes the composition of the forest floor by destroying trees and allowing sunlight to reach the ground, essentially inhibiting succession from occurring. The South Carolina Exotic Plant Pest Council lists this species as a severe threat. Disturbance increases the rate of infestation.

Range map

www.invasiveplantatlas.org/subject.html?sub=3083

References/Websites

http://plants.usda.gov/java/profile?symbol=WISI

www.invasive.org/species/subject.cfm?sub=3083

www.trees.sc.gov/pubs/invasivespecies.pdf

Japanese Climbing Fern

(Lygodium japonicum)

Japanese climbing fern, native to Asia and Australia, was introduced to North America as an ornamental. It grows rapidly in sun or shade, disturbed or undisturbed habitats, and smothers native vegetation. It climbs up trees, acting as a ladder fuel during fires. It produces spores, which can spread this invasive fern. The rhizomes can also be transferred from infested areas on equipment, such as bulldozers and fire ploughs. Pine straw operations with infestations often spread it when they distribute infested straw to new locations. Currently it is a problem in the coastal region but has spread as far as the lower Piedmont.

Websites

www.invasivespeciesinfo.gov/profile/japanese-climbing-fern

www.trees.sc.gov/pubs/invasivespecies.pdf

Tree of Heaven

(Ailanthus altissima)

Tree of heaven is a native of Asia that was brought to North America as an ornamental shade tree in the 1700s. Like many invasive ornamentals, the characteristics that made it attractive also made it invasive; wide tolerance of habitats and conditions, no pests or diseases, and ease of cultivation. It has spread throughout North America from coast to coast. The arrival of the spotted lanternfly has put tree of heaven back in the spotlight since it is the preferred host of later instars and adults of this newly arrived invasive insect.

Website

www.trees.sc.gov/pubs/invasivespecies.pdf

Callery Pear

(Pyrus calleryana)

Callery pear, also known by many ornamental variety names, such as, Bradford pear and Cleveland Beauty, is native to Asia. Originally introduced to North America as a fire blight resistant rootstock for pears, the vase-like form, red fall foliage, and abundance of white flowers in the spring made this a popular ornamental. At first, it was innocuous enough; the trees were sterile and so produced no fruit and did not spread. However, about the year 2000, many Callery pears began to produce fruit. Birds fed on and moved these fruits to old fields and clearings, where Callery pear is commonly seen now. The rootstocks began to sprout and were able to fertilize scion pears as well as other sprouting rootstocks. The offspring are very thorny and aggressive growers, taking over whole fields and excluding the recruitment of native trees. Callery pear is becoming a problem in forest management. Site preparation of tracts with Callery pear are difficult as the large thorns damage equipment and tires. We are just seeing the beginning of Callery pear as a pest; as forests are harvested, Callery pear is positioned to move into these tracts. If Callery pear seeds within a year of a forest being planted, they can survive and will remain a part of that tract unless removed.

Website

www.trees.sc.gov/pubs/invasivespecies.pdf

CATEGORY: MODERATE THREATS

EleagnuMultiflora Rose
Paulownia
Sericea Lespedeza

Tropical Soda Apple

CATEGORY: LOW THREATS

English Ivy
Garlic Mustard
Japanese Knotweed
Mimosa
Miscanthus
Periwinkle
Phragmites
Kudzu
Chinaberry

Diseases

CATEGORY: EARLY DETECTION RAPID RESPONSE

Sudden Oak Death, Ramorum Leaf Blight, Ramorum Twig Blight or Dieback

The fungal-like organism, *Phytophthora ramorum*, causes the forest disease termed Sudden Oak Death. The disease currently results in widespread dieback of several tree species in California and Oregon forests. Sudden oak death is considered a threat to the nation's oak woodlands, urban forests, and the ornamental nursery industry as the cause of ramorum blight of common ornamentals. Trade in nursery stock resulted in movement of this pathogen from source populations on the West Coast to locations across the United States, thus risking introduction to other native forests. Infested areas currently include 15 California counties and a portion of one county in Oregon. In addition, diseases caused by *P. ramorum* have been detected in 11 states (CA, OR, WA, AL, GA, MD, MI, NJ, NC, PA, SC) at 30 sites (24 nurseries and 6 in the landscape). Pest risk assessment is based on the following risk elements: climate-host interaction; host range; dispersal potential; economic impact; environmental impact; and pest opportunity determined the risk presented by *P. ramorum* to be high in South Carolina. *Phytophthora ramorum* infects leaves and twigs of common ornamental plants, for example, rhododendron, camellia, pieris, and kalmia, which can serve as vectors for pathogen dispersal. Currently natural hosts are expanding and 35 families, 70 genera, and over 109 species are now documented. In cooperation with the South Carolina Forestry Commission, Clemson University annually conducts several sudden oak death surveys in streams and at plant nursuries throughout the state.

References

O'Brien J. G., Manfred E. Mielke, Steve Oak, and Bruce Moltzan. *Sudden Oak Death*. USDA Forest Service, NA-PR-02-02, 2002.

APHIS List of Regulated Hosts and Plants Associated with *Phytophthora ramorum*, (Revision dated 5 May 2008 (corrected 30 May)), this list is updated often. The most current version is posted at: www.aphis.usda.gov/plant_health/plant_pest_info/pram/

Website

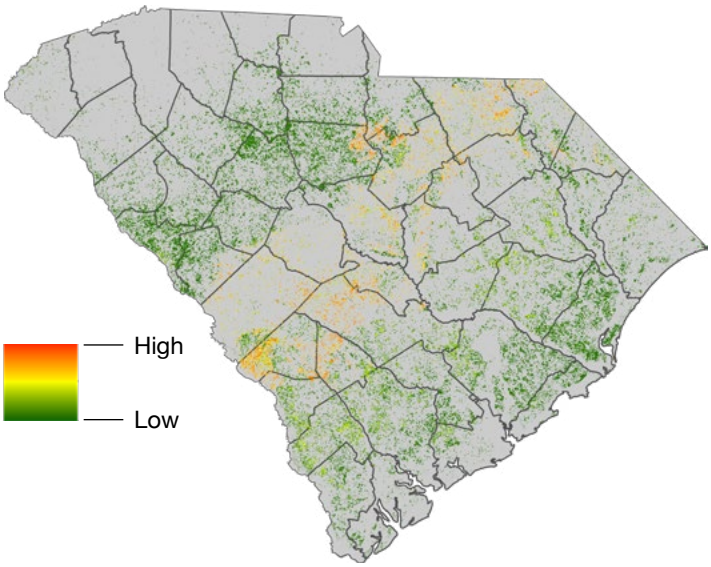
www.aphis.usda.gov/aphis/ourfocus/planthealth/plant-pest-and-disease-programs/pests-and-diseases/phytophthora-ramorum/sod

CATEGORY: MAJOR THREATS

Annosus Root Rot

Annosus root rot, caused by the native fungus *Heterobasidium annosum*, can be very destructive to pines located in areas of risk. The fungus primarily infects loblolly, slash, shortleaf, white, and longleaf pines, but also can infect eastern red cedar. The fungus enters a stand when airborne spores land on and grow in a freshly cut stump or wounded roots. The fungus causes the roots to rot and can spread into nearby healthy trees through root grafts. The result in healthy trees is loss of growth, susceptibility to blow over, increasing susceptibility to pine beetle attack, or mortality. Pines growing in sandy or sandy loam soils are susceptible to root rot, especially if thinning occurs during the winter

Figure 13. Heterobasidion root disease hazard



months when the spore-producing conks are most active. Additionally, trees that are planted on old field sites are more susceptible than trees planted in a historically forested situation. Each year losses due to annosus root rot are observed throughout the high-risk soil types. Losses statewide can be as high as over 10,000 acres affected annually.

References

Robbins, K. 1984. *Annosus root rot in eastern conifers*. Forest Insect & Disease Leaflet 76. USDA Forest Service.

Insects and Diseases of Trees in the South. 1989. R8-PR16. USDA Forest Service - Forest Health Protection.

Website

https://wiki.bugwood.org/HPIPM:Heterobasidion_annosum

Fusiform Rust

Fusiform rust is caused by the native fungus *Cronartium quercuum f. sp. fusiforme*. This fungus primarily affects loblolly, slash, and to a lesser extent, longleaf pines. The fungus primarily enters a tree through wounds, branch scars, or needle scars, and causes cankers. If the fungus grows from an infected branch into the main stem, the resulting canker is a point of weakness/breakage and can lead to mortality. This disease can cause serious losses in nurseries, reduce tree growth, increase susceptibility to pest problems, and result in stem breakage. The potential distribution of this insect in South Carolina is all pine and pine-hardwood stands which occur in every county of the state.

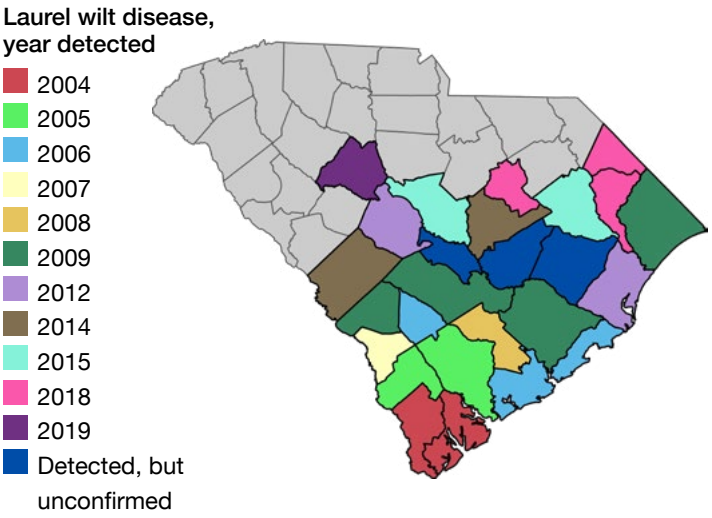
References

Insects and Diseases of Trees in the South. 1989. R8-PR16. USDA Forest Service - Forest Health Protection.

Laurel Wilt Disease
(vectored by redbay ambrosia beetle)

The redbay ambrosia beetle (*Xyleborus glabratus*) is a non-native ambrosia beetle first detected in the United States near Savannah, Georgia, in 2002. This beetle is responsible for vectoring the laurel wilt fungus (*Raffaelea lauricola*) into the sapwood of redbay (*Persea borbonia*) and other trees in the laurel family (Lauraceae). The beetle is native to Southeast Asia (Japan, Taiwan, Myanmar, and the Bonin Islands). Laurel wilt has caused high levels of redbay mortality in South Carolina, Georgia, North Carolina, Louisana, Mississippi, Alabama, Tennessee, Kentucky, and

Figure 14. Laurel wilt disease



Florida. The current range of laurel wilt disease in South Carolina includes: Colleton, Orangeburg, Beaufort, Jasper, Hampton, Allendale, Bamberg, Barnwell, Orangeburg, Colleton, Dorchester, Charleston, Aiken, Georgetown, Marlboro, Dillon, Kershaw, Lee, Marion, Calhoun, Richland, Lexington, Williamsburg, Florence, Newberry, Berkeley, and Horry Counties. Laurel wilt has the potential to threaten redbay (*Persea borbonia*), swampbay (*P. palustris*), sassafras (*Sassafras albidium*), spicebush (*Lindera benzoin*), pondberry (*Lindera melissifolia*), pondspice (*Litsea aestivalis*), avocado (*Persea Americana*), and possibly other species in the Lauraceae family. *Lindera melissifolia* is currently a federally endangered plant, and *Litsea aestivalis* is currently a multi-state threatened plant. The female *X. glabratus* beetle carries fungal spores on her mouthparts. After the female beetle bores into a tree, she makes tunnels in the sapwood in which she will lay eggs. During this boring process, the fungal spores are released from the mandibles, and the fungus grows in the tunnels. Infected trees react by forming blockages in water transfer elements, causing the tree to wilt and eventually die from lack of water. This fungus is extremely fast-acting, and trees typically die within a month after being infected.

Redbay trees are of high ecological value. Songbirds, bobwhite quail, and turkeys often feed on the fruit, while deer and bears frequently feed on foliage and fruit of redbay and sassafras. Palamedes swallowtail butterflies rely on redbay trees for completion of their life cycle (larvae feed on the redbay leaves). Additionally, spicebush swallowtail butterflies complete their lifecycle on sassafras and spicebush (both in the Lauraceae family). This exotic pest can spread to new areas through the movement of infested wood, such as firewood or dead wood being

transported for disposal.

Officials estimate that natural spread is about 20 miles per year, but movement of infested firewood, wood chips, and logs may be a major factor in spreading the disease into new locations not contiguous with the main area of infestation.

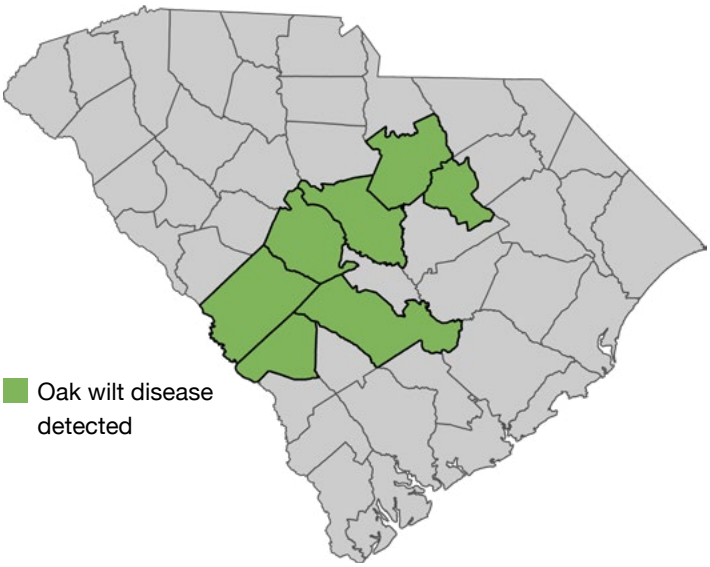
References

Various sources at www.invasivespeciesinfo.gov/profile/laurel-wilt

Oak Wilt

Oak wilt, a vascular wilt disease of white and red oaks, is caused by the fungus *Bretziella fagacearum*. Oak wilt was first identified in Wisconsin in 1942 and although this disease has been found in 21 states (Starkey, USFS), it is responsible for severe mortality of live oaks only in central Texas. The Oak wilt fungus causes affected trees to wilt and usually to die. Oak species in the red oak group (northern red, scarlet, and black oak) are affected more frequently and die more readily than oaks in the white oak group (white, post, and chestnut oaks). Once a tree is infected, the fungus spreads via roots grafts to adjacent trees, thus resulting in infection centers. Additionally, sap feeding beetles can spread the spores to nearby healthy trees and over long distances. Control strategies in the forested landscape consists of killing infected trees; control strategies in the urban landscape consists of removing infected trees and trenching between diseased and healthy trees which will eliminate root grafts and prevent tree-to-tree spread. In South Carolina, Oak Wilt has been identified in 7 counties (Aiken, Chesterfield, Kershaw, Lancaster, Lee, Lexington, and Richland) from one live oak (Aiken County), scrub oaks, and water oaks.

Figure 15. Oak wilt disease



References

Insects and Diseases of Trees in the South. USDA Forest Service - Forest Health Protection, R8-PR16, 1989Starkey, Dale A., USDA Forest Service 2009, Personal communication.

Website

https://forestinvasives.ca/Meet-the-Species/Pathogens/Oak-Wilt

CATEGORY: MODERATE THREATS

Oak Decline Complex
Littleleaf Disease
Sycamore Anthracnose

CATEGORY: LOW THREATS

Brown Spot Needle Blight
Pitch Canker
Dogwood Anthracnose
White Pine Decline
Pine Needle Cast

Priority Areas

For Priority Area Maps, see Appendix 2.

ENHANCING THE BENEFITS OF SOUTH CAROLINA'S TREES AND FORESTS

This section describes the benefits that South Carolina's trees and forests provide – economic impact, clean water, clean air, livable communities, health benefits and more.

Economic Impact

Forestry makes a significant contribution to South Carolina's economy through the manufacture of wood and fiber-based products as well as ecosystem services and non-timber forest products. The South Carolina Forestry Commission published estimates of forestry's economic contribution in 2006, 2013, 2015 and 2019. These studies focused primarily on the economic contributions of forestry's manufacturing industry, although selected non-timber forest products like pine straw and some ecosystem services like forest-based recreation were included. In the 2019 report, forestry's total economic contribution to South Carolina's economy was $21.2 billion. Forestry-related employment jumped from 84,425 in 2017 to 98,306 in the latest report. Of the aggregate forestry sectors included in this study, wood furniture and forest-based recreation showed the greatest increase from 2017 while the pulp & paper and logging aggregate sectors showed the greatest decline. Despite the recent decline, the pulp and paper aggregate sector accounts for 60% of forestry's total economic contribution. Compared to other leading industries in the Palmetto State, forestry ranks #1 in jobs, #2 in labor income, and #3 in direct economic output.

Over the past decade, since the Great Recession, forest products manufacturing has been steadily recovering in terms of manufacturing capacity. The Timber Products Output surveys have documented an increase in wood processing in every survey from 2009 to 2018 (see www.trees.sc.gov/prod.htm). At the national level, housing starts have improved incrementally until by February 2020 both single-family and multi-family housing starts exceeded the 58-year average. The pulp and paper industry migrated their product mix away from newsprint to fluff pulp and containerboard for packaging. However, the COVID19 pandemic which is unfolding at the time of the writing of this report will surely have significant impact on the economic health of the industry in the short run, and may cause further shifts in product mix in the long run.

SCFC 2020-2030 Strategic Plan

The Commission is working to increase the full range of benefits from South Carolina's forests.

GOAL: Enhance Public Benefits from Trees and Forests

Strategy 1 – Promote programs and practices that safeguard South Carolina's water, air, soil, wildlife habitat, recreation, and natural beauty.

Strategy 2 – Deliver programs and services that retain, develop, and expand sustainable timber and non-timber markets.

Strategy 3 – Engage communities to grow and sustain healthy trees and forests.

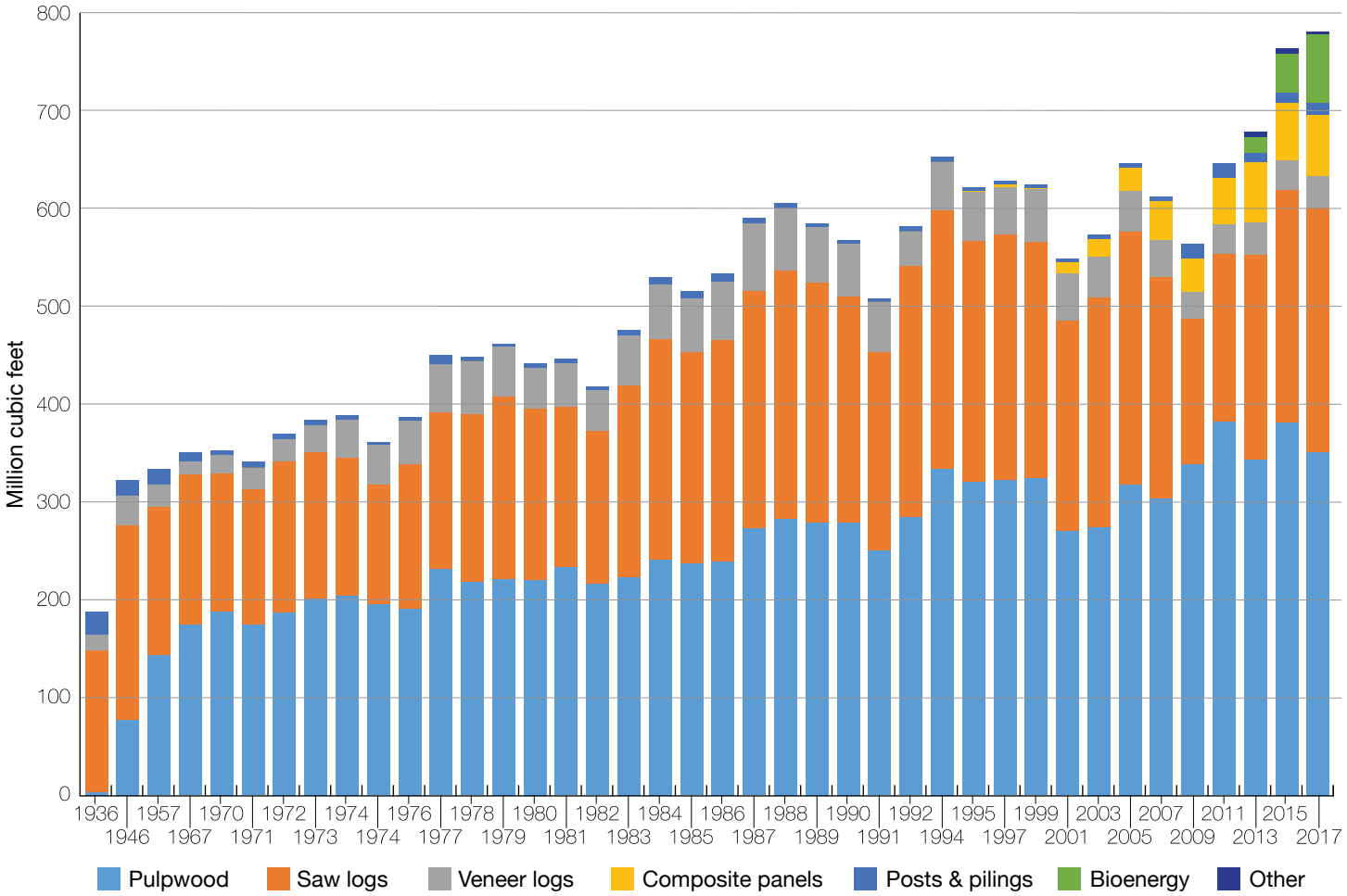
Strategy 4 – Engage in tree improvement to improve the health and productive capacity of our forests.

More emphasis on domestic manufacturing of essential sanitary supplies and an increase in online shopping because of social distancing might result in increased wood consumption in the US South.

Growth of South Carolina's forest products manufacturing capacity has mirrored the growth in our forests. A "wave of wood" was set into motion in the late 1980s by a combination of factors: 1) an echo planting of the Soil Bank plantings of the 1950, 2) new plantations funded by the Conservation Reserve Program and 3) reforestation following the devastation of Hurricane Hugo. As it reached commercial pulpwood size, the wave of wood brought industrial growth in the oriented-strand board and biomass industries in South Carolina.

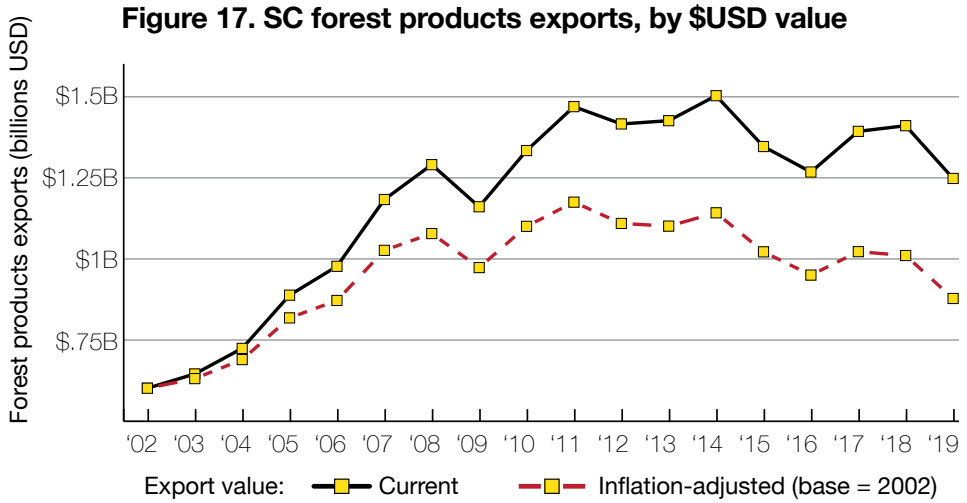
Now, after 3 decades of growth, the forests have matured into predominantly sawtimber size classes which has allowed our solid wood products industry to expand. South Carolina has more standing timber volume in our forests than ever recorded by the Forest Inventory and Analysis Program. Current industrial sectors targeted for growth include building materials which utilize sawtimber sized trees, such as laminated veneer lumber and cross-laminated timber. Even with the growth in our domestic manufacturing industry, surplus sawtimber logs are available for global markets.

Figure 16. Production of primary timber products in South Carolina, 1936-2017



Forest products continue to be a leading export commodity by volume from South Carolina ports. In 2019, the total value of forest product exports totaled $1.25 billion with pulp and paper products accounting for 84% of that value. Solid wood product exports, such as lumber and logs, added another 9% with wood furniture, wood chemicals and woodworking machinery rounding out the remainder. Of the 123 total trade partners in 2019, the top five (Canada, China, Mexico, India, and Italy) accounted for 41% of the total value of exports that year. Trends in pulp and paper exports have been negative over the past decade while solid wood products, wood chemicals and woodworking machinery have trended upward at about 9% per year. The role of the South Carolina Forestry Commission in helping companies expand global markets has been to produce market reports for selected countries and to make business connections through in-bound and out-bound trade missions.

Figure 17. SC forest products exports, by $USD value



Ecosystem services and non-timber forest products have the potential to grow into significant markets in the future. Naturallyoccurring carbon sequestration by trees has commercial value through carbon trading, credits, and markets. In the past, only larger landowners have been able to enter the carbon market. However, efforts by organizations such as the American Forest Foundation to group smaller landholdings, may make carbon trading attractive to smaller landowners (American Forest Foundation 2020).

Other natural forest processes, such as water quality and water flow, may develop commercial value or be further regulated to maintain quality and quantity. Meanwhile, family forest owners continue to market pinestraw, mushrooms, Christmas trees, various recreational activities such as hunting leases, and other non-timber products and services, so that they will have cash flow at a sufficient level to allow them to keep land in a forested state or, in some cases, simply to keep ownership of the land.

In summary, South Carolina's forest industry is healthy, but continued growth is dependent on a sustainable supply of wood balanced across size classes, expanding global markets for wood products and ongoing research and development in the areas of forest management productivity and wood product development.

As forest industry has consolidated, state forestry agencies have played a critical role in university-based research cooperatives, such as the North Carolina State Cooperative Tree Improvement Program.

To meet agency goals of enhancing the resource and supporting forest industry, the South Carolina Forestry Commission must maintain staffing and funding for key programs. The Forest Inventory and Analysis (FIA) Program documents the extent and health of the state's forests and these data are collected over a five-year cycle. Staffing of FIA Forester positions has been an issue and creative solutions must be utilized to solve this problem. The Forest Analyst and Forest Products Marketing Specialist positions provide customized solutions in support of forest industry and forest landowners. Finally, staffing for the agency's Tree Improvement Program in support of research on increased forest productivity has been problematic.

For long-term success in providing premier forest tree seedlings for reforestation, the Tree Improvement Specialist position must be staffed to provide adequate leadership in the program.

Water Quality and Quantity

Water is a critical resource for all aspects of life, from health and recreation to biodiversity and economic development. Therefore, it is not surprising that stakeholders indicated water quality and water quantity as high priority issues. It has been shown that forests produce the highest water quality and most stable streams of any land use (Myers et al. 1985; Brown and Binkley 1994), and properly managed forests yield the greatest benefits. South Carolina is 66% forestland (USDA Forest Service 2019), and a significant portion of the state's water resources are linked to healthy forests (Liu et al. 2020). It is imperative that forestland in South Carolina be properly managed, appropriate best management practices (BMPs) implemented and education and outreach be ongoing to educate the citizens and visitors of the state that healthy forests are critical to maintain desirable water quality and quantity in the state.

Several water classifications may indicate desirable water quality. These include state and federally designated scenic rivers, Outstanding Resource Waters, and waters supporting threatened and endangered aquatic wildlife. Trout waters and source water protection areas for drinking water further indicate quality water resources that may need special management considerations. Headwater streams are especially important for water quality, and isolated wetlands present unique habitats for biodiversity. In these areas, efforts should be made to maintain healthy watersheds or focus management efforts to restore degraded ones. Strategies may include riparian corridors, headwater protections, water quality BMPs, and targeted landowner outreach.

Certain watershed features can lead to greater risk of negative impacts and suggest the need for additional attention. The percent of forest and natural cover within a watershed and the percent of impervious cover are two general indicators of watershed water quality. Studies have demonstrated that water quality conditions commonly begin to degrade when the forest and/or natural cover percentage drops below 70 percent in a watershed (Black and Munn, 2004; NCDWQ, 2009c). Past land uses are also a consideration, especially where they have left the surface eroded, gullied, and/or barren. Other features to address include slope, erodible soils, riparian areas, and wetlands. Occurrence of these features may indicate a higher potential for negative impacts from forestry activities.

South Carolina DHEC has identified areas with significant threats to water quality. These designations are based on

the state 303(d) listing of impaired waters and watersheds with current or in-process Total Maximum Daily Loads (TMDLs)[1]. The US Environmental Protection Agency (EPA) describes "impaired waters" as those not clean enough to meet the standards of their best intended use (such as swimming, supporting aquatic life and water supply). Impairment may result from a wide range of sources and pollutants. Although none of these impaired areas in South Carolina are linked specifically to forestry activity, opportunities may exist to mitigate or buffer impacts from other uses by using forested buffers. In these areas forest management can capture, absorb, detain, or retain pollutants and contribute to cleaner, healthier water.

Compared to other land uses, the negative impacts of forest management activities on water quality are minor, with silviculture being the lowest leading source of impairment in Southern states (see Table 6) (Dissmeyer 2000; Lockaby et al. 2013). Timber harvesting is viewed by some as a potential source of water pollution, but normally leaves understory and organic material in place, and results in little disturbed or exposed soil (USFS 2002). Regular timber harvests provide an important income stream to landowners and are critical in the effort to minimize the amount of forestland that is converted to other land uses. The development of new markets, such as biomass harvesting, led to concern that the removal of tops and branches from a harvest site may lead to increased soil erosion and sediment input into waterbodies. A recent study, however, showed that there was no significant increase in soil erosion between conventional and biomass harvests (Barrett et al. 2016).

Sediment is typically the most significant nonpoint source pollutant from silviculture with the greatest risk of impact being sediment from roads and stream crossings (Cristan et al. 2016). Failure to follow Best Management Practices (BMPs) in riparian areas can also result in increased turbidity, water temperature and nutrient levels, and lowered dissolved oxygen. Fortunately, considerable research has shown use of Best Management Practices to be successful in controlling and preventing nonpoint source pollution during forestry activities (USFS 2002; Cristan et al. 2016) and sites typically recover within two to three years as vegetation grows (USFS 2002). Maintaining forested land use and implementation of applicable BMPs is important in riparian areas to maintain the current high standard of water quality. BMPs are designed to address most conditions, but adjustments are sometimes needed for waters with high richness or uses. With a growing number of research studies evaluating BMPs and strategies to further minimize environmental impacts by harvesting operations, it is important to periodically update existing BMP recommendations and continue providing education and technical assistance to forest landowners, managers, and contractors about proper implementation of BMPs.

The SC Forestry Commission is the state agency designated to provide oversight and guidance for forest management practices and to establish BMPs for forestry. South Carolina's BMPs for Forestry are applicable for all silvicultural activities, with specific guidelines for timber harvesting, road construction, stream crossings, riparian buffers, wetlands, site preparation, reforestation, prescribed burning and firelines, pesticide and fertilizer application, wildlife improvements, and minor drainage. The agency provides educational opportunities through ongoing trainings and public speaking, and technical assistance through a BMP Courtesy Exam program designed to improve compliance and implementation.

The BMP Courtesy Exam program offers free services to identify potential environmental impacts from forestry operations. Specially trained BMP Foresters visit sites before, during, and after operations to offer recommendations and ensure all applicable BMPs are being implemented correctly. Courtesy Exams are initiated on request, but sites may also be located by complaint, incident, or through aerial detection. Failure to implement BMPs may result in regulatory violations that are reported to the appropriate enforcement agency for possible action. In addition, the forest industry in South Carolina has a strong commitment to supporting compliance with BMPs and may take action when suppliers fail to comply.

Overall compliance with South Carolina's Best Management Practices for Forestry was 97 percent in 2016 for timber harvesting operations (Nicholson 2017). Across the nation, the BMP compliance rate is 92% (National Association of State Foresters 2019). This indicates that

Figure 18. Sources of sediment, by land use type

Land Use	Sediment Yield (tons/acre/year)
Undisturbed Forest	trace - .32
Careful Clearcut	.06 - .17
Careless Clearcut	1.35
Mechanical Site Prep	5.60 - 6.36
Cultivated Field	.42 - 7.50
Careless Agriculture	7.80 - 43.06
Active Construction	48.40 – 218.91

the South Carolina BMP Program is highly successful, and that landowners, loggers, and forestry professionals demonstrate a strong commitment to protecting water quality. Harvesting compliance in South Carolina has shown continual improvement since the first monitoring study was started in 1989 (see Figure 19).

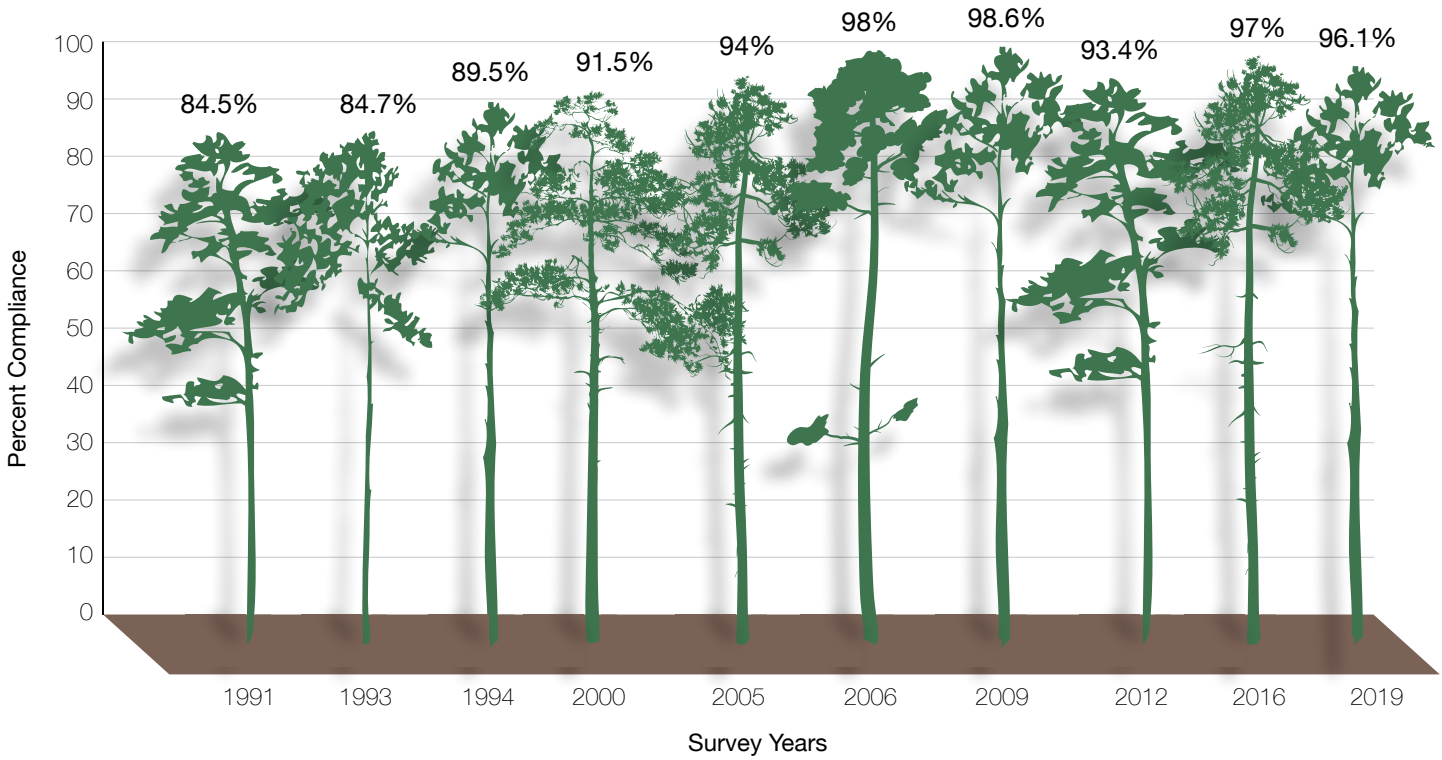
Compliance rates show that knowledge of BMPs has been expanded over the last 30 years. The majority of forestry professionals in the state are familiar with BMPs with over 1,000 people trained annually through the Timber Operations Professional (TOP) program. Currently, failure to install adequate BMPs is more commonly a result of the cost of implementation, not lack of understanding in the standard. The wood products industry has placed the responsibility of BMP implementation on the contractors (loggers, site prep contractors, dozer operators, etc.), but do not always offer the pricing support necessary to adequately protect water quality. To ensure BMP compliance remains high, and to maintain water quality protections during forestry operations, cost share, or other incentive programs should be established to help cover the cost of BMP implementation. The highest potential for negative impact comes from haul roads and stream crossings, so the focus should be placed on those areas. Temporary bridges can help to avoid stream crossing issues as they can be installed and removed with minimal impact and can be reused for years if treated properly. Cost share for culvert installation is also a high priority as newly installed culverts are rarely sized large enough to carry expected storm flow or adequately stabilized after installation.

In addition to the Courtesy Exam program the SC Forestry Commission provides support to help landowners protect water quality by providing forest management plans, cost-share assistance, and reforestation advice. Commission foresters routinely offer information on all aspects of resource management, including BMPs.

Managing water resources is the responsibility of many state and federal agencies, and is the focus for many other organizations, businesses, and citizens. For example, the SC Forestry Commission has a Memorandum of Agreement with (and regularly cooperates with) the US Army Corps of Engineers and the South Carolina Department of Health and Environmental Control (DHEC) on silvicultural water quality issues under jurisdiction of the SC Pollution Control Act and Clean Water Act. In addition, the Forestry Commission's BMP Courtesy Exam Program is supported by a US EPA Section 319 grant administered by SCDHEC.

An issue of such wide-ranging importance to both society and the environment requires an interdisciplinary and multi-jurisdictional approach involving many partners and stakeholders. The SC Forestry Commission provides technical expertise, experience, and resources on the role of forestry in water quality. The agency also seeks new partnerships and strives to strengthen communications with

Figure 19. Overall BMP harvesting compliance, by year



existing partners to focus on a wide range of water issues across the state, from source water protection statewide water planning to wetland mitigation. In addition, the Commission can promote the use of tree cover and forest management to protect water quality and streambank stability from adjoining land uses.

A closely related, high-profile subject has been water quantity and availability. In recent years, related issues have included water rights, reservoir management, in-stream flow needs, and drought. Industrial, agricultural, and human consumption of water are often at odds, competing for limited available resources. Indigenous aquatic life and other beneficial water uses are also considerations. SC Department of Natural Resources (SCDNR) is the agency tasked with establishing a water plan for the State. The third version of the State Water Plan is currently in progress and aims to effectively balance the economic, environmental and social needs of South Carolina for generations to come.

South Carolina has an abundant supply of freshwater but is not immune to water quantity issues. Inter-basin transfers and years of drought have led to disputes with neighboring states over water use. Most of South Carolina's major rivers are shared with North Carolina and Georgia. Dams, diversions, canals and other hydrologic modifications alter the natural path of water, creating varied positive and negative effects to ecosystems and society. Groundwater supply is also an issue, especially in the coastal plain. Surface and groundwaters are connected, but with varying degrees of intensity relative to recharge and discharge.

Although forests play an important role in providing clean water, issues of water quantity are largely beyond the traditional scope of the SC Forestry Commission. However, forests provide most of the available potable water and serve as the most efficient water filters. With responsibility for overall forest resource management in South Carolina, the SC Forestry Commission has a role to play in helping protect water quality and quantity. Timber harvesting can result in increased water yield for several years until new growth is established. Species composition can affect water yield as well. Depending on the circumstances, conversion of forests or cover types may increase or decrease stream flow. Where ownership and goals within a watershed match, forest management can be used to affect water yield. Scientists at the US Forest Service's Coweeta Laboratory have done extensive research on this topic and are a great resource for further information to highlight the types and persistence of water yield changes that can occur in connection to forests and their management (www.srs.fs.usda.gov/coweeta/).

There are countless opportunities for the SC Forestry Commission concerning water quality and quantity including additional work with partner agencies and focusing on education and outreach focusing on the importance of forestry for sustained water resources, conservation, and stewardship.

Source Water Protection

Source water protection is a proactive approach to safeguard, maintain, or improve the quality and/or quantity of drinking water sources and their contributing areas. Effectively managing the areas through which water travels and the activities that occur in those areas helps protect the quality and quantity of available drinking water. It is well documented that forests provide outstanding source water protection and generate the most stable and highest quality water supplies among all land uses. (Brown and others 2008, 2016; Caldwell and others 2014; Vose 2019). Currently 45% of South Carolina's population is served by surface drinking water and 60% of that water supply originates on forestland. Sound stewardship of forest land is imperative to ensure a clean and reliable water supply for South Carolina now and into the future.

South Carolina is blessed with abundant forest land. However, population growth and development has accelerated over recent years, a trend that is projected to continue. This population growth and associated land conversion, from forest to non-forest, increases water demand and has the potential to affect the quantity and quality of water supply. Research has shown that lands converted from forest to residential, commercial and/or agriculture use result in higher levels of sediment, nutrients, pesticides and other toxins entering waterbodies (Jackson and others 2017, Webster and others 2018).

Of the 12.9 million acres of forestland in South Carolina, 58.3% are family owned and 33.8% are owned by a corporation. Both privately and corporately owned forest land are vulnerable to urban development as the development value of the land usually far exceeds the potential revenue source from traditional forest products. Regardless of ownership, the water quality benefits generated by these forests are most times provided to the public at low to no cost. To successfully retain forest lands, financial incentives must be made available to landowners. They need financial incentives, in addition to their intrinsic motivation, to keep their forests as forests.

Ecosystem services markets, tax incentives, BMP cost-share programs and other such incentives will need to be developed and implemented to retain as much existing forest land as possible. In addition, incentives need to be put in place to encourage landowners to implement BMPs and manage their forest land in a way that protects and enhances water quality.

As the lead agency for forestry BMPs and forest management, the SCFC is well positioned to take a leadership role in source water protection in the state. Water utilities, municipalities, and a host of other partners in South Carolina are working together to meet national and state drinking water protection requirements under the Safe Drinking Water Act. The SCFC has joined in this effort, with the help of outside partners, focusing on the Catawba/Wateree River basin and the Savannah River basin. In addition, they are supporting work on Watershed Based Plans across the state.

The Commission has also recently become involved in the Keeping Forests initiative that is striving to keep the 245 million acres of forestland across the Southeast as forestland. Part of this work focuses on developing an ecosystem services market to incentivize landowners to keep their forests as forests. The SCFC should continue to foster and build productive relationships with partners and projects such as these to promote the importance of sound forest management and stewardship.

The prosperity of the State relies on safe, clean, affordable drinking water. Keeping forested land forested is a key strategy in the effort to maintain a stable, high-quality water supply.

Glossary

Source water - a raw, untreated supply of water – typically surface water or groundwater – used for existing or potential future drinking water.

[1]TMDL – Total Maximum Daily Load - written quantitative analysis of water quality for a pollutant at one or more sites in a watershed. (Source: DHEC – Available online at: www.scdhec.gov/environment/water/regs/r61-110.pdf)

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Air Quality

Air quality is defined as a measurement of the pollutants in the air; a description of the healthiness and safety of the atmosphere (Dictionary 2010). South Carolina's forests play a major role in filtering the air of pollutants (including ozone and particulate matter) but can act as a source of particulate matter when wildfires rage through them. Forestry practices such as prescribed burning can reduce these fuel loads, thereby reducing the negative effects of wildfires. Forests also respond positively to carefully planned and executed prescribed burning with improved growth as competition for sunlight, water, and minerals is reduced.

Trees sequester atmospheric CO2 through the process of photosynthesis. This sequestration exceeds the CO2 emissions generated by events such as forest harvests, land conversions, and fires. However, methane from forest fires amount to about 5 percent of the total. Forest fires also produce about 1 percent of the total nitrous oxide emissions. Forest fires in this context include prescribed burns and wildfires (USFS 2007).

New housing developments often lead to increased levels of air pollutants. For example, as the population grows and industry moves in to meet the population's needs, increased levels of air pollutants such as sulfur dioxide, nitrous oxide and mercury are emitted into the atmosphere. In South Carolina, attainment levels for sulfur dioxide and nitrous oxide are met due in large part to strict air quality regulations. Landscaping with trees around industrial sources of pollution can help filter such pollutants, thus reducing the negative impacts on air quality (Flynn 2010).

Other sources of air pollutants include vehicles. However, with new emissions equipment and standards, the quantity of these pollutants has actually been decreasing. And, with active urban forestry programs where tree planting and arbor care are implemented, additional reductions in the pollutants released by vehicular emissions can be achieved.

Urban tree plantings can also play a significant role in energy conservation especially in metropolitan areas where population densities are greatest. Trees tend to decrease the temperatures around these heat sources, resulting in less ozone being produced.

SCDHEC conducts ambient air monitoring across the state. Presently, South Carolina meets all the national ambient air quality standards (NAAQS), including ozone and PM2.5 and there are no non-attainment areas[1] in the state (as of 2020). SCDHEC provides ozone forecasting during ozone season and has provided PM2.5 forecasting during significantly elevated pollutant events.

Current Activities

One of the main forestry-related sources of air pollution in South Carolina is wildfires. These uncontrolled fires can generate large amounts of particulate matter and can cause significant smoke problems downwind. Not only is there no means of controlling the direction in which the smoke from wildfires spreads, these fires can occur on days when smoke dispersion is poor. (In contrast, prescribed burns are conducted in a manner that minimizes downwind impacts and are not allowed when dispersion is poor.)

Over the last five years, South Carolina has averaged 1,418 wildfires per year that burned a total of approximately 10,500 acres. Human activities are the primary cause (98 percent) of wildfires in South Carolina with about 40-45 percent due to escaped debris burns. A reduction in the number and size of human-caused wildfires can help reduce the negative effects on air quality (SCFC 2010a).

Prescribed burning is one forest management tool used by forest managers to help reduce the hazardous fuel buildups that often accumulate in the forest lands around South Carolina. By conducting prescribed burns, fuel buildups are reduced lessening the chance of a disastrous wildfire. Prescribed burns also burn less intensely, produce less particulate matter and, therefore; have less of an impact on the atmosphere than wildfires (Hessburg and Agee 2003). In South Carolina, forest managers prescribe burn an average of 400,000 acres annually for wildlife, forestry, and agriculture purposes. These prescribed burns are managed so that they produce limited amounts of smoke as compared to wildfires.

The South Carolina Smoke Management Guidelines provide for minimizing the impact of smoke from vegetative debris burning operations for forestry, agriculture, and wildlife purposes. To do this, the Guidelines define smoke sensitive areas, amounts of vegetative debris that may be burned, and atmospheric conditions suitable for burning this debris. The SC Forestry Commission is responsible for administering the Smoke Management Guidelines. In doing so the Commission consults with and coordinates activities with the National Weather Service and the South Carolina Department of Health and Environmental Control (SCDHEC-Bureau of Air Quality) to ensure compliance with air quality standards as outlined in the Memorandum of Understanding (SCFC 2006).

It is unusual for ozone problems to occur during the prescribed burning season (late winter through spring) but can be a problem with summer wildfires when ambient ozone levels are higher. Ozone is created by reactions

Figure 20. Ozone 8-hour design values, 2010-19

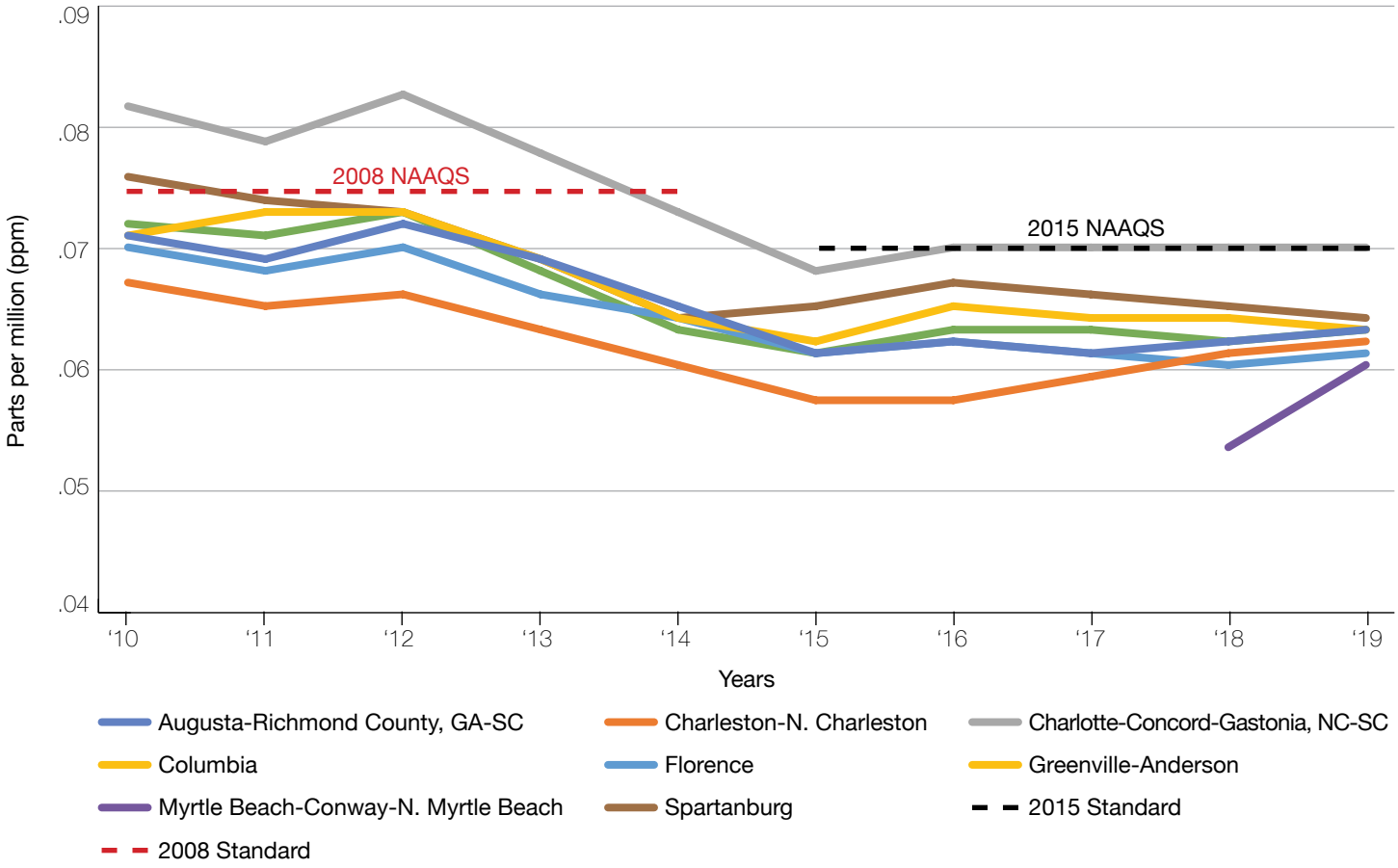
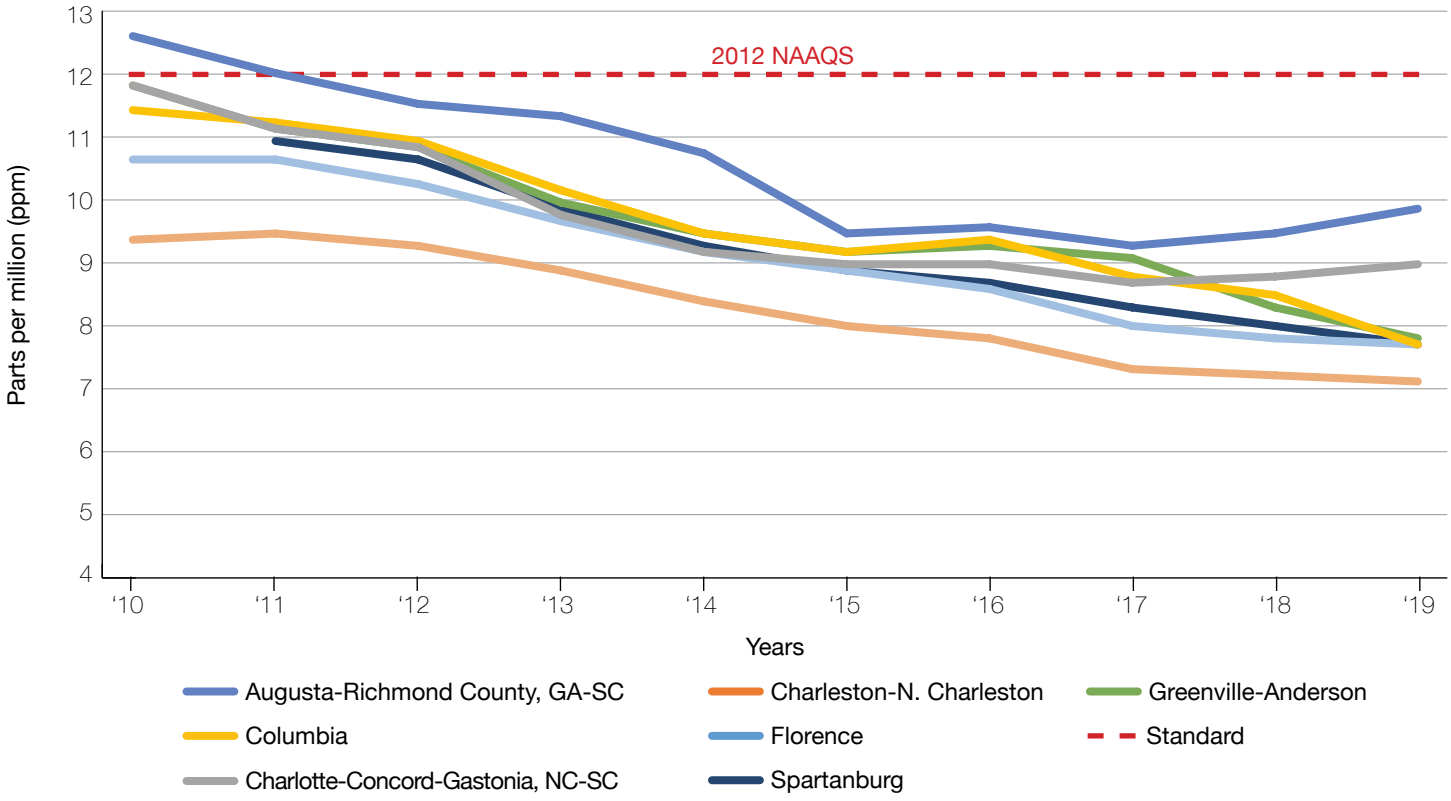


Figure 21. $PM_{2.5}$ annual design values, 2010-19



involving sunlight and nitrogen dioxide (created by combustion) creating O3. High summer temperatures and direct sunlight combined with burning of forest fuels (and other sources of NO2) can result in elevated amounts of ozone. In the last five years ozone levels have decreased due in large part to tighter emissions controls on power plants and automobiles.

Particulate Matter, (PM 2.5) is measured in micrograms and since 2003 has been decreasing. This decrease in atmospheric particulate matter is due to reduced sulfur content of diesel fuel, the reduction of coal combustion and better emission controls for utility boilers. This reduction in PM2.5 has been documented across the Southeast.

Contributing to the amount of ozone produced are approximately 320,000 yard debris burns, as well as burns associated with the clearing of land for development and the maintenance and installation of highway rights-of-way. These burns are not regulated by the Smoke Management Guidelines but are restricted by SCDHEC Regulation 61-62.2 – Prohibition of Outdoor Burning (SCFC 2006).

When prescribed burning is conducted in the wildland–urban interface (WUI), the smoke that is produced can sometimes inconvenience people, and it can also cause serious health and safety problems. The public is unlikely to continue to tolerate the use of prescribed fire, regardless of the benefits, if burn managers cannot keep smoke out of smoke–sensitive areas (Wade et al. 2007).

Negative public reaction to smoke generated by prescribed and debris burns can lead to the passage of ordinances such as county–wide burn bans. Such burn bans may not consider the positive effects of prescribed burning. Therefore, they should be scrutinized to ensure that forestry, wildlife and agriculture burns are exempt from such ordinances. The SC Forestry Commission's continued collaboration with SCDHEC will keep the forestry, wildlife and agriculture burns in mind as regulations affecting air quality are pursued.

The SC Forestry Commission's urban and community forestry program provides opportunities for communities to address the care of urban forests and plan for green space to help offset the negative impacts of urban developments on air quality. SCFC Urban and Community Forestry (U&CF) staff provide technical assistance and grants to help communities plan, establish, and take care of urban trees which absorb significant amounts of air pollutants and reduce surface temperatures. Refer to the chapter on community forests in South Carolina for additional information.

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Glossary

[1]non-attainment areas – areas designated by the EPA as not meeting the NAAQS. For ozone the standard is 0.075 parts per million and the standards for PM 2.5 are 35 µg/m3 (24-hour standard) and the annual PM2.5 standard is 15 µg/m3.

Urban and Community Forests in South Carolina

The community forest is the aggregate of all vegetation and green spaces within populated places. Urban and community forests are an integral part of cities, subdivisions, streets, residential yards, parks, and open spaces. This urban forest provides benefits and values vital to enriching the quality of life where South Carolinians live, work and play. Properly cared for and well-managed community forests can provide economic and social values that far exceed their management costs.

Urban and community forestry is the combination of planning, establishing, and managing trees and associated plants (individually, in groups, or under forest conditions) within cities, towns, suburbs and military bases. Community forest management addresses the interface between people, the built environment and trees through a dynamic interaction of various professions including forestry, horticulture, arboriculture, landscape architecture and urban planning.

As our cities continue to grow in population and land coverage, urban and community forest management is critical for healthy and sustainable living. Essential components of a well-managed and fully integrated program include full-time staff and equipment, tree management and zoning policies, tree mapping (such as canopy coverage and tree inventories), management plans, a sustained budget and local political and community support.

Approximately 100 communities, representing 2.8 million South Carolinians, have some level of tree management. The Urban and Community Forestry program tracks, classifies and assists these communities into three distinct management levels as defined by the USDA Forest Service requirements for receiving federal funds for the state program implementation. These levels are: (1) managed, (2) developing, and (3) non-participating. A managed community is one that has established all of the following components: a full-time professional staff position, a management plan, tree policy, and an advocacy group. A developing community is one that has established one to three of the above listed components. A non-participating community is one that has not yet established any of the above listed components. Listed below are the operational definitions for, and examples of, the program management components.

Professional Staffing: An individual who has one or more of the following credentials, and who the community directly employs or retains through written agreement to advise and/or assist in the development or management of their urban and community forestry program: 1) a degree in urban forestry or a closely related field (e.g., forestry, horticulture, arboriculture, etc.), and/or; 2) International Society of Arboriculture Certified Arborist (ISA) or equivalent professional certification.

Management Plan: A detailed document or set of documents developed from professionally based inventories/resource assessments that outline the future management of the community's trees and forests. Examples of management plans include: Urban Forest Master Plan, Public Tree Planting and Maintenance Plan, Comprehensive Land Use Plan including tree canopy analysis that incorporates specific management recommendations for the community's trees and forest resources, and a Hazard Tree Reduction and Replanting Plan based on an inventory of community trees.

Ordinance/Policy: Statutes or regulations that direct citizens and local governments in the planting, protection and maintenance of urban and community trees and forests. Examples include: Public Tree Care and Maintenance Ordinance, Tree Preservation and Landscaping Ordinance, Watershed Protection Ordinance, and Tree Conservation and Tree Warden Ordinance.

Advocacy/Advisory Organization: An organization that is formalized or chartered to advise (organizations established by the local government) or advocate or act (non-governmental organizations active in the community) for the planting, protection and maintenance of urban and community trees and forests.

Approximately 40% of incorporated municipalities (>1,000 in population) live in a managed community. This represents 1,564,734 South Carolinians. Approximately 32% of incorporated municipalities (> 1,000 in population) live in a developing community. This represents 1,279,305 South Carolinians. The Urban and Community Forestry Program has the potential to help 3.9 million South Carolinians.

The goal of the SCFC's Urban and Community Forestry (U&CF) Program is to create, enhance and support long-term local, regional and statewide community forestry programs. To accomplish this, the U&CF staff provides

state-wide technical and educational assistance regarding the components listed above as well as tree canopy assessments and inventories, grant project implementation, tree and utility line issues, and air and water quality issues. Additional services offered include Tree City USA and Tree Campus USA implementation, proper tree selection, installation, care and maintenance, distribution of educational information, coordination and delivery of training workshops, and Arbor Day/Earth Day activities. Technical support including assessment of ecosystem services such as stormwater uptake and air quality benefits, are also offered to interested communities. Primary assistance is provided to personnel working for towns, cities and counties. Secondary assistance is provided to professional associations, civic, nonprofit and volunteer organizations, state agencies, educational institutions, businesses and others.

The Urban and Community Forestry Program has also provided financial assistance to a wide array of entities in the form of 1-to-1 cost-share grants. Over the years, the program has made grant awards to municipalities, counties, non-profit organizations, state agencies and educational institutions across the state. There are four basic categories which are available for funding: (1) Community Forestry Program Development, (2) Community Forestry Program Improvement, (3) Information & Education, and (4) Public Tree Planting. The program has also provided support for mapping tree canopy and plantable areas, calculating ecosystem services, integrating better tree management into city and county government agencies, and modeling connectivity of large forest cores and corridors. The U&CF program has placed a special emphasis on planning for tree and forest conservation as 'green infrastructure' and has supported the development of a statewide forest green infrastructure model and associated green infrastructure plans for counties, cities and towns. In 2019, the program supported development of a demonstration project and guide to maximizing forest connectivity in conservation subdivisions.

These grants have not only helped establish most of the municipal forestry programs that exist today and cited above, but have also provided funding for thousands of trees to be planted in public spaces and have helped provide the skillset needed for those charged with public tree management. Hundreds of local government and university tree managers have been able to attend urban forestry and arboriculture related educational events and at least a dozen folks have become ISA Certified Arborists or Municipal Specialists through this program. This educational and accreditation assistance is not available through any other state agency.

Each year, SCFC Urban and Community Forestry staff provides technical, educational, and/or financial assistance to over 50 local government entities with a collective population of over 2 million citizens. U&CF staff also led the development of the Forest Resources Institutea multi-day course designed to equip planners and community foresters to plan for and better conserve trees and forested landscapes.

The type of assistance described above is very specialized and is only provided in South Carolina by the SC Forestry Commission. No other public agency fills this much-needed niche. While the potential and need for the Urban and Community Forestry Program to impact many more communities and SC citizens exists, the optimal resources to do so do not.

One of the tools used to engage and initiate community forest management within municipalities is the Tree City USA program (www.arborday.org/programs/treeCityUSA/). Tree City USA is a community improvement program sponsored by The National Arbor Day Foundation in cooperation with the US Conference of Mayors, the National League of Cities, the National Association of State Foresters, the USDA Forest Service and the SC Forestry Commission. To qualify, a community must meet four standards:

- Establish a tree commission or designate a municipal department responsible for public trees
- Develop, pass, and implement a municipal public tree care ordinance
- Conduct a local Arbor Day observance and celebration
- Spend two dollars per capita on community forest management

These standards provide a framework for action and initial direction for a community forestry program. Like the first rungs on a ladder, the standards help get a community started toward annual, systematic management of its tree resources. South Carolina's Tree Cities have remained steady over the past 10 years at around 40 municipalities. In addition, there were seven Tree Campus USAs and one Tree Line USA in 2020.

In providing assistance to local units of government, the Urban and Community Forestry staff has developed relationships in many communities across the state. These include personnel in the following departments:

planning and zoning, public works, parks and recreation, and city leadership. In addition, Community Forestry staff promote relationship-building with other agencies (SCDOT, SCDNR and NRCS), professional organizations (SC Chapter of the American Planners Association, SC Green Industry Association, and the Municipal Association of SC), and non-profits (Trees SC, tree boards, and beautification boards).

All of these factors help connect the public with trees, forests and the Forestry Commission in general. It is through these connections that staff help bridge the gap when local government struggles with wildland-urban interface issues during expansion of population and jurisdictional boundaries.

Human Benefits of Trees and Forests

Trees and forests have a quantifiable impact on the economic, social, and physical well-being of people. Folks gravitate toward green and well-landscaped areas where trees are the predominant feature. Trees planted in public places (streets, parks, schools, cemeteries, and college campuses, for example), collectively referred to as 'urban or community forests' as well as forested areas, parks, and greenspaces provide a wide array of tangible and non-tangible benefits to the public. Trees provide the public with a suite of ecosystem services that improve the local environment thereby improving quality of life.

Economic Benefits

Trees are major capital assets in cities and towns. Just as streets, sidewalks, sewers, public buildings and recreational facilities are a part of a community's infrastructure, so are publicly owned trees. Trees, and collectively community forests, are important assets that require care and maintenance the same as other public property (USFS 2003).

Many municipal governments value community forests for the aesthetic value they provide. Trees contribute value to companies' brand as their upkeep and maintenance convey implicit messages of care and pride. By improving community aesthetics, trees can bolster local economies by attracting businesses, consumers, and tourists to an area (GFC 2010). Trees contribute to the character and identity of a town's malls and streets. Some tangible economic benefits of community forests include:

- More income for businesses. Customers will pay as much as 9% percent more for some goods and services provided by businesses that are located on tree-lined streets (Wolf 2005). Treescaping can increase business income by 20% (Burden 2006).
- Surveys show a 30 percent higher sales rate for shopping areas with large numbers of shade trees versus sales of the same products in shopping areas without trees.
- Customers tend to linger longer in areas with trees than those that are barren,
- Trees absorb and store an annual average of 13 pounds of carbon each year. Community trees across the United States store 6.5 million tons of carbon per year, resulting in a savings of $22 billion in control costs (GFC 2010).
- Employees who have a view of trees are more productive, with 23 percent less incidence of illness than those who cannot see trees. Those with a view also report a higher level of enthusiasm for their job and are generally more patient than those without a view (Wolf 1998).

The presence of trees also has a positive effect on occupancy rates and residential home sales.

- Several case studies cite the presence of trees influenced 75% of decision-making in the home-buying process, increased the real-estate value between 0.48% to 30% in comparison to homes and neighborhoods without trees (Mullaney, Lucke, and Trueman 2015).
- The National Association of Realtors (NAR) found that 57 percent of voters surveyed were more likely to purchase a home near green space and 50 percent were more willing to pay 10 percent more for a home located near a park or other protected area.
- Homes located within 1,500 feet of natural forest areas enjoy statistically significant property premiums, on average $10,648, compared to $1,214 for urban parks, $5,657 for specialty parks and $8,849 for golf courses (in 1990 dollars). (Shoup and Ewing 2010).
- Wooded apartment complexes provide preferred aesthetics that can increase occupancy rates and rental price, (SCFC 2010, Roy et al. 2012).

A hedonic evaluation of home values by Kathleen Wolf (controlling for all other factors, such as location of the development) showed price increases based on the condition and location of residential trees as follows. Buyers will pay:

- 2% more for mature yard trees (greater than 9-inch dB)
- 3-5% more for trees in front yard landscaping

- 6-9% for good tree cover in a neighborhood
- 10-15% for mature trees in high-income neighborhoods (Wolf 2007)

The same evaluation showed the benefit to the development overall, when comparing market prices for treed lots versus untreed lots:

- 18% more for building lots with substantial mature tree cover
- 22% more for tree-covered undeveloped acreage
- 19-35% more for lots bordering suburban wooded preserves
- 37% more for open land that is two-thirds wooded

Thus, trees and forested land clearly add value to development. Conservation subdivisions are one tool to ensure intact forests are protected and connected. In 2019, the SCFC published Forest Connectivity in the Developing Landscaping: A Design Guide for Conservation Developments which is available at www.trees.sc.gov/urbconnectguide.pdf

Energy Conservation

Trees can have a significant impact on energy conservation.

- Trees can help cool the "heat island" effect in our inner cities and downtown areas. These islands result from storage of thermal energy in concrete, steel and asphalt. Heat islands are 3 to 10 degrees warmer than the surrounding countryside. The collective effect of a large area of transpiring trees (evaporating water), and the cooling-effect of the shade provided by trees reduces the air temperature in these areas, between 5 and 20 degrees C.
- Vegetation has an average cooling effect of 1-4.7 degrees Celsius that spreads 100-1000 m into urban areas (Kleerekoper, Van Esch, and Salcedo 2012)
- On a sunny day, the evapotranspiration of a tree alone cools with a power equal to 20-30 kW, a power comparable to that of more than 10 air conditioning units (Kleerekoper et al. 2012).
- Strategically placed shade trees - a minimum of three large trees around a home - can reduce air conditioning costs up to 30 percent. Shade trees offer their best benefits when deciduous trees are planted to shade all hard surfaces such as driveways, patios and sidewalks to minimize landscape heat load. (USFS 2003).
- In dense urban residential areas, neighboring houses often share in the energy conservation benefits of a shade tree. Studies estimated that the shading of adjacent buildings contributes to an additional electricity load reduction of 15% (Sawka et al. 2013)

Air Quality

Trees can also have an impact on air quality.

- Trees and other plants release oxygen (02) for us to breathe and in turn, absorb carbon dioxide (CO2) and other dangerous gases. An acre of trees produce enough oxygen for 18 people every day.
- During one year, an acre of trees absorb enough CO2 to equal the amount produced when a car is driven 26,000 miles.
- Trees help to settle out, trap and hold particulate pollutants (dust, ash, pollen and smoke) that can damage human lungs and reduce the formation of ground-level ozone, a pollutant that can reduce lung function and inflame the linings of the lungs while also damaging habitats. Trees are particularly effective at capturing airborne pollutants including ozone, nitrogen oxides, Sulphur oxides, sulphur dioxides, carbon monoxide, carbon dioxide and particles less than 10 micrometers in size (Mullaney, Lucke, and Trueman 2015)

Water Conservation

Urban impervious surfaces convert precipitation to stormwater runoff, which causes water quality and quantity problems. Urban canopies, street trees, and other urban vegetation can help decrease the volume and mitigate the effects of stormwater runoff. Trees interact with the urban hydrologic cycle by:

- Intercepting incoming precipitation
- Removing water from the soil via transpiration
- Enhancing infiltration by increasing soil permeability through improved soil structure from forming root systems

All the above factors contribute to fewer chemicals being transported to streams. (USFS 2003)

- Studies estimate that one tree can help avoid $1.08 per cubic meter of stormwater treatment, and up to $47.85 per tree (Endreny et al. 2017; Soares et al. 2011). Stormwater treatment avoidance is a measurable ecosystem service of non-treatment of stormwater runoff by wastewater facilities. It is measured in dollars per cubic meter of runoff.
- Tree City USA program participants intercepted an

average stormwater volume of 128.7 m3/km of street length compared to non-participants (59.2 m3/km of street length) (Berland and Hopton 2014)

Recreation

South Carolinians are very fortunate to have tremendous outdoor recreational opportunities. Currently, there are 5 state forests, 8 national wildlife refuges, 2 national forests, 75 heritage preserves, 47 state parks, 87 wildlife management areas (many of these also are national forests, heritage preserves or state forests), and 1 national park that offer some form of public outdoor recreation. In addition to these public outdoor recreational opportunities, many people also enjoy outdoor activities on private forests. Hunting is one of the most common forms of outdoor recreation on private lands.

South Carolina's forests and wild lands offer some of the best hunting in the Southeast both in terms of game populations and opportunities. Recent studies have shown that 1.7 million people participate in wildlife-related activities in South Carolina, including fishing, hunting, and observation. 744,000 state residents and nonresidents fished, 254,000 state residents and nonresidents hunted, and 1.1 million state residents and nonresidents observed wildlife. These outdoor recreational activities have a significant economic impact. In a 2011 survey from the U.S. Fish and Wildlife Service, it was estimated that wildlife-related activity had a $1.7 billion dollar impact in the state. (Willis and Straka 2016).

South Carolina's forests also offer excellent back country camping and trail use opportunities. There are thousands of miles of hiking, biking, canoe, and equestrian trails that traverse mountains, rivers, swamps, Carolina bays, state parks, national wildlife refuges, national and state forests, coastal preserves, and other unique and interesting landscapes. The growing popularity of forest-based recreation is evidenced by the growing list of guides, books, and maps covering a cross-section of outdoor activities.

South Carolina's forests support a wide range of recreational opportunities and support a $1.7 billion dollar outdoor recreation industry. These activities would not be able to take place without the forested areas throughout South Carolina. As the population of South Carolina continues to grow, so will the demand for outdoor recreational opportunities. This growing demand may be a catalyst for forest retention as proper management and retention of existing forest land is imperative to ensure these opportunities are available for generations to come.

Health Benefits

Forests contribute to the health of individuals as well. Studies have found a correlation between community forests and the average amount of physical activity exerted by neighborhood residents. People are more inclined to get outdoors and exercise when their surroundings are greener. In addition, well-treed streets cause people to perceive distances as shorter, leading to increased walking (Tilt, Unfried and Roca 2007). Greater physical activity can increase cardiovascular health, which may reduce other health problems associated with sedentary lifestyles, such as heart disease and diabetes. The increase in physical activity can improve mental health by reducing stress and anxiety. Savings to individuals and the nation can be substantial: health care costs in America associated with obesity top $100 billion a year.

The increase in physical activity as described above can improve mental health by reducing stress and anxiety. The Japanese Ministry of Agriculture, Forestry, and Fisheries coined the term "Shinrin-yoku" or "forest bathing" as a method of preventative medicine. Research indicates that forested environments promote lower concentrations of cortisol, lower pulse rates, lower blood pressure, greater parasympathetic nerve activity, and lower sympathetic nerve activity than do city environments (Park et al. 2010). Post-operative stays are shortened when patients have a view of trees and open spaces.

Trees filter airborne pollutants and can reduce the conditions that cause asthma and other respiratory problems. Asthma incidents increase in urban communities where trees are eliminated in favor of new roads, homes, or commercial developments. The American Lung Association estimates that ozone-associated health care costs Americans about $50 billion annually (ALA 1997).

Children who spend more time outside pay better attention inside. Attention-deficit/hyperactivity disorder (ADHD) children are better able to concentrate, complete tasks, and follow directions after playing in natural settings.

By reducing air temperatures and building energy use, and directly removing ozone and NOx from the air, trees reduce ozone concentrations. However, trees can also influence volatile organic compound (VOC) emissions that can lead to ozone formation.

Trees provide shade and therefore provide some degree of protection from the sun. Tree canopy coverage on school grounds and where people gather to shop and recreate can help decrease the chance of skin cancer formation.

Social Benefits and Public Health

Studies have identified a direct correlation between the number of trees and amount of grass in community common spaces and the use of those common spaces by residents, which leads to more opportunities for informal social interaction and greater relationships between neighbors. While benefits to society and public health are harder to quantify in contrast to biophysical benefits (air quality, rain interception, energy conservation), the benefits of urban trees and community greenspaces are important to the health and well-being of South Carolinians.

- Trees make communities livable for people and soften the outline of masonry, metal and glass.
- Trees can be associated with specific places, such as memories of past events or times, or a favorite tree climbed as a youth.
- Trees give communities a sense of identity and are points of interest to tourists. South Carolina is affectionately referred to as the Palmetto State. Tourist destinations in the Lowcountry include visits to the majestic Angel Oak of Johns Island, as well as to the historic plantations with picturesque avenues of live oaks. These specimens, aesthetically pleasing, and noteworthy trees are highlights of any tourist's trip to South Carolina and certainly contribute to the tourism industry in Charleston and its surrounding sea islands.
- Less violence and fewer crimes occur in urban public housing where there are trees. Researchers suggest that trees afford a place for neighbors to meet and get to know each other (Kuo and Sullivan 2001). Their research showed that friendships developed into a network of support.
- Trees improve public health through improved air quality, reduced stress, increased exercise, and improved social connections (Hystad et al. 2014)
- Trees contribute to increased neighborhood walkability, which is associated with increased exercise (Frank et al. 2005); Lovasi et al. 2011)
- Increased access to greenspace is associated with reduced stress (Donovan 2017)and loneliness and an increased sense of community (Kim and Kaplan 2004; Maas et al. 2009).
- Trees provide accessible nature in urban areas. Lack of access to nature is known as nature deficit disorder and this issue has seen growing attention in recent years. It refers to the effects that occur when children do not have close interaction with outdoor natural areas. The popular book Last Child in the Woods by Richard Louve synthesized literature that describes how access to treed landscapes can reduce Attention-Deficit/ Hyperactivity Disorder (ADHD) and create healthier kids (Louve 2008).

Research suggests that trees in public rights of way, close to homes, in areas with high air pollution, and in particular, parks and other greenspace likely produce the greatest public health benefits (Donovan 2017).

South Carolina is fortunate to have an abundance of forestland despite population growth over the past 20 years. This growth has been accompanied by urban/ suburban sprawl primarily in regional pockets of growth in the Greenville-Spartanburg corridor, the Midlands, and areas along the coast. While continued population growth and land development fragments forestland it also offers opportunities to promote statewide tree planting initiatives. It also provides the opportunity to explain the importance and value of trees and forests to non-traditional audiences such as those in energy production, drinking water, health care, economic development and citizen groups.

Perhaps the biggest threat that links all of these factors is the potential loss of political support, cost-share grants and staffing to provide technical, educational and financial assistance to the entities that have a major role in benefiting most from the environmental services that trees and forests provide.

Trees present an educational opportunity to connect youth with nature. Basic tree identification, mensuration, and ecosystem services are subjects offered by after school programs such as Envirothon. By partnering with environmental organizations, state agencies, and the Forestry Commission, schools can increase awareness of the importance of not only trees and forests, but other natural systems of South Carolina. SCFC will continue to pursue opportunities to establish Envirothon programs, and support other educational opportunities for grade school students by delivering school programs on subjects such as forest ecosystems, tree identification, and forest mensuration.

Trees present recreational and educational opportunities to connect communities with nature. In urban areas, community parks, and other greenspaces, th agency works with local municipalities, planners, and managers to provide educational opportunities to the public. SCFC encourages planners to plant native tree speciesand helps communities to consider becoming members of Tree City USA. On State Park lands, SCFC can provide input as

subject matter experts, and offer to partner on opportunities to enhance recreational opportunities, like hiking and birding, by helping with planting selections to increase wildlife viewing opportunities, and provide fun facts about trees for interpretive signs.

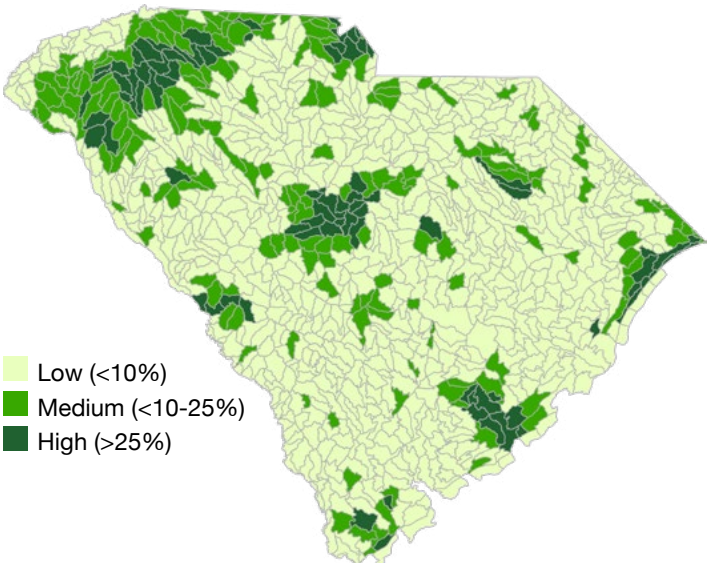
In a changing climate, trees provide the ability to sequester atmospheric carbon and store it as wood as a mitigating step. Various forestry management practices have the most potential of known natural climate solutions to sequester and store atmospheric carbon. However, research indicates that most forest landowners in the southeastern US have a poor understanding of carbon sequestration, but a willingness to implement a project under the right financial conditions. As such, the SCFC will work to improve the scope and breadth of management options provided in forest management plans to better address carbon sequestration, engage with carbon market creditors to target landowner outreach for carbon projects to decrease the knowledge gap, and keep candidate landowners on a list for potential carbon projects. Furthermore, a market demand for carbon credits and carbon-storing, high-volume demanding wood products such as cross-laminated timber (CLT) could incentivize forest landowners to grow and manage for carbon storage. However, there is a paucity of knowledge in the United States on the economic viability of utilizing CLT as an alternative building material. SCFC will also work with industry professionals and carbon creditors to grow and communicate the collective knowledge surrounding carbon projects, CLT, and the potential impact to the timber market in South Carolina.

Stormwater Management

Over 80 percent of the U.S. population lives in cities (US Census 2018). As a result, more and more people are disconnected from natural resources such as the forests that support them and the watersheds in which they live. As a result, urban residents may take for granted the important benefits provided by forests and trees in their own back yards.

Urban watershed forestry represents an important management approach given the many benefits provided by urban forests. Forestry practices are vital when considering the impact of land development on forest structure and function as well as overall watershed health. Managing urban forests in ways that explicitly address watershed health can mitigate some of the negative impacts of forest fragmentation, soil compaction, and increased impervious cover in urban watersheds.

Figure 22. Impervious surface cover



A partial listing of the watershed benefits of urban forests and the unique properties of the urban planting environment are as follows:

- Reducing construction and maintenance costs (by decreasing costs related to clearing, grading, paving, mowing and storm water management);
- Reducing stormwater runoff and flooding; a large mature tree can intercept and absorb thousands of gallons on stormwater annually,
- Reducing urban heat island effect[1]
- Enhancing function of stormwater treatment;
- Improving soil and water quality;
- Reducing stream channel erosion;
- Providing habitat for native plants, terrestrial and aquatic wildlife; and
- Preserving of native ecotypes.

Impervious surfaces such as roads, roofs, driveways, streets, and parking lots increase not only stormwater volume, but also the rate of flow. The volume of runoff in an urban area is five times greater than that of an equally large forested area (US EPA 2003). The consequences of stormwater runoff in populated places are flooding, soil erosion, and non-point source contaminants, which negatively impact both the built and natural environment. Impacts to the built environment include property damage and loss and poor-quality drinking water. Impacts to the natural environment include waterway sedimentation and poor water quality for aquatic life.

In accordance with federal legislation, South Carolina adopted a permitting process designed to manage

stormwater. The stormwater rules require all construction sites of one acre or more, many industrial sites, and all regulated Municipal Separate Storm Sewer Systems (MS4s) to obtain a permit. Currently, there are over 100 municipalities throughout the state that are required to comply with the MS4 regulations. In addition, EPA stormwater rules require many of South Carolina's cities and towns to implement public outreach and education programs as part of their local efforts to reduce pollutants in stormwater runoff.

The main influence of urban watershed problems, and hence, stormwater management is land conversion of greenspace to grayspace. Examples of this land use change are the conversion of forests (greenspace) to streets (grayspace) and fields to parking lots. As with many environmental issues, stormwater management is not confined to jurisdictional boundaries. In 2019, the SCFC supported development of a new tool to calculate stormwater uptake from trees called the Trees and Stormwater Calculator Tool. Localities with updated canopy data can use the tool to determine stormwater uptake for trees in different storm events as well as the nitrogen, phosphorus and sediment uptake provided by trees. It allows communities to set canopy goals and realize the consequences of tree losses or additions. For more see www.trees.sc.gov/gic-stormwatersummary12.pdf

Urban forests, when combined with the other natural features in a watershed (parks, fields, trails, garden etc.), are often referred to as "Green Infrastructure". Green Infrastructure is defined as "an interconnected network of green spaces that conserves natural ecosystem values and functions and provides associated benefits to human populations" (Benedict, and McMahon 2006). As opposed to the conventional "gray infrastructure" of impervious roads, culverts and pipes, this green infrastructure has the effect of mitigating many of the adverse effects of urbanization including stormwater control problems. Through interception of rainfall, uptake of water in forest biomass and the preservation of pervious soils, the green infrastructure provides a valuable service in limiting the extent and intensity of rain events while filtering urban pollutants that would otherwise reach natural water bodies (USDA 2020).

Natural resources professionals know the many benefits and values of trees and forests. These experts must be more proactive in reaching those outside of the field who can benefit from this knowledge. Although the Forestry Commission does not have any control over the pace of population growth or development, the agency can influence how communities of people and structures are arranged and built. This can be accomplished through affecting local planning and zoning policy, educational awareness, and technical assistance.

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Glossary

[1]urban heat island effect - an area, such as a city or industrial site, having consistently higher temperatures than surrounding areas because of a greater retention of heat, as by buildings, concrete, and asphalt. (source: www.answers.com/topic/urban-heat-island)

Glossary

Green infrastructure – an interconnected network of green spaces that conserves natural ecosystem values and functions and provides associated benefits to human populations

Priority Areas

See Appendix 2.

STRATEGIES

Introduction

This section outlines strategies that have been selected to address the 15 priority issues that were described in the preceding section of this document. In addition, SC Forestry Commission program areas are also described and strategies are referenced. The strategies addressing the priority issues are outlined in the same order as in the assessment: Overarching Issues appear first, followed by strategies aligned under the three national themes of Conserving Working Forests, Protecting Forests from Harm, and Enhancing Public Benefits from Trees and Forests. Most of this information is presented in a matrix format, with the national priority that each action item supports listed.

Overarching Issues

	National Priorities	Programs Involved	Reporting	Performance Measures
Overarching Issues	**P=Protect C=Conserve E=Enhance**	**State & Private Forestry Programs* SCFC Programs**	**Position that Tracks Progress**	**Individual Measures and Performance Indices**
Issue 1: Population Growth				
Strategy 1. Support landowners with programs and services that promote active forest management and help them meet their goals.				
Resources Needed: Funding for Project Foresters, technology, and support staff; Training; Partner engagement (NRCS, FSA, et.al.)				
Action 3.1.1: Promote and manage federal, state, and private cost-share programs.	C	Stewardship*, Comm.	Forest Mgmt Chief	Outreach Effort Index, # of Landowners assisted, Forest Management Effort Index, Landowner Satisfaction
Action 3.1.2: Provide technical assistance to forest landowners.	C, P	Stewardship*, Comm., Forest Health*, BMP	Forest Mgmt Chief	NWOS Intensification, % of new landowners, # of Landowners assisted, Forest Management Effort Index, Landowner Satisfaction
Action 3.1.3: Conduct monitoring to measure effectiveness of agency programs.	C	Stewardship*	Forest Mgmt Chief	Landowner Satisfaction, Forest Management Effort Index
Action 3.1.4: Provide training for foresters and others to expand their knowledge base and improve delivery of technical assistance.	C, E	Stewardship*, BMP, WUI	Forest Mgmt Chief	Use of ArcGIS, # of Seat Hours of Training
Action 3.1.5: Promote use of conservation easements and other tools designed to retain working forests	C, P	Stewardship*, Comm., Forest Legacy*, State Lands	Forest Mgmt Chief	Outreach Effort Index, Forest Legacy Projects
Action 3.1.6: Work with agency partners to share information and coordinate initiatives	P, C, E	Stewardship*, BMP, WUI, Forest Health*	Forest Mgmt Chief	# of Partners Engaged
Strategy 2. Promote and increase the responsible use of prescribed fire.				
Resources Needed: Support of partners (FASC, USFS, et.al.); Funding for tools, equipment, and personnel				
Action 3.2.1: Provide training for the prescribed fire community.	P, C, E	Fire*, State Lands	Training Coord.	# of CPFM classes offered, % of acres burned conducted by CPFM burners
Action 3.2.2: Promote the benefits of prescribed burning to retain social license to burn.	P, C, E	Fire*, Comm., WUI, Stewardship*, Forest Health*, State Lands	Comm. Dir.	Outreach Effort Index, Wildfire Suppression Index, Wildfire Prevention Index, Customer Satisfaction
Action 3.2.3: Increase the resources available for prescribed burning.	P, C, E	Fire*, Comm., Stewardship*	Forest Protection Chief	# of CPFM classes offered, % of acres burned conducted by CPFM burners
Strategy 3. Demonstrate practices for the active, sustainable, multiple-use management of State Forests, and engage other public landowners to do the same.				
Resources Needed: Coordination among SCFC program areas; Support of partners (NWTF, DNR, Clemson, et.al.)				
Action 3.3.1: Actively demonstrate sustainable forestry practices on public lands.	P, C, E	Comm.*, State Lands, Forest Health*, BMP	State Lands Coord.	Outreach Effort Index, # of Demonstration Sites, Acres of Certified Forestland

Overarching Issues	National Priorities P=Protect C=Conserve E=Enhance	Programs Involved State & Private Forestry Programs* SCFC Programs	Reporting Position that Tracks Progress	Performance Measures Individual Measures and Performance Indices
Action 3.3.2: Host educational events for forest landowners and the public.	P, C, E	Comm.*, Stewardship*, Forest Health*, BMP, State Lands	State Lands Coord.	Outreach Effort Index, # of Events Held
Action 3.3.3: Make state forests available for research projects.	P, C, E	State Lands	State Lands Coord.	# of Current Research Projects
Strategy 4. Actively seek opportunities to acquire land to grow the State Forest system.				
Resources Needed: Funding for acquisition; Support of partners (Conservation Bank, Forest Legacy, et.al.)				
Action 3.4.1: Research strategically significant properties that may be available.	C, P	State Lands	State Lands Coord.	# of Properties Evaluated
Action 3.4.2: Seek and secure financial resources to make acquisitions.	C	State Lands, Forest Legacy*	State Lands Coord.	# of Funding Inquiries Made
Issue 2: Public Perceptions About Forestry				
Strategy 1. Promote the Forestry Commission as South Carolina's first and foremost source for forest management information and assistance.				
Resources Needed: Operating expenses for personnel and technology/equipment; training/continuing education; grant funding for statewide initiatives.				
Action 4.1.1: Provide educational programs for a variety of audiences.	P, C, E	all programs	Comm. Dir.	Outreach Effort Index
Action 4.1.2: Gather more feedback (focus groups, research)	P, C, E	Comm.	Comm. Dir.	Outreach Effort Index
Action 4.1.3: Increase use of unpaid media	P, C, E	all programs	Comm. Dir.	Outreach Effort Index
Strategy 2. Educate the public on the environmental benefits of working forests and the role of strong markets and family forest owners in keeping our forests healthy.				
Resources Needed: Operating expenses for specialized education personnel and technology/equipment; training/continuing education; support of partners; grant funding for special projects and statewide initiatives.				
Action 4.2.1: Provide educational programs for a variety of audiences.	P, C, E	all programs	Comm. Dir.	Outreach Effort Index, # of Programs, # of Participants
Action 4.2.2: Utilize conventional and social media to promote the value of sustainable forestry.	P, C, E	Comm.	Comm. Dir.	Outreach Effort Index
Action 4.2.3: Coordinate with partners to increase public engagement.	P, C, E	all programs	Comm. Dir.	Outreach Effort Index
Strategy 3. Continue to promote the economic benefits of forestry.				
Resources Needed: Operating expenses for specialized education personnel and technology/equipment; training/continuing education; support of partners; grant funding for special projects and statewide initiatives.				
Action 4.3.1: Provide educational programs for a variety of audiences.	P, C, E	all programs	Comm. Dir.	Outreach Effort Index, # of Programs, # of Participants
Action 4.3.2: Utilize conventional and social media to promote the value of sustainable forestry.	E,C	Comm.	Comm. Dir.	Outreach Effort Index
Action 4.3.3: Coordinate with partners to increase public engagement.	P, C, E	all programs	Comm. Dir.	Outreach Effort Index
Strategy 4. Engage stakeholders to maintain a forestry friendly business environment.				
Resources Needed: Operating expenses for specialized education personnel and technology/equipment; training/continuing education; support of partners; grant funding for special projects and statewide initiatives.				
Action 4.4.1: Engage in public policy discussions related to forestry.	P, C, E	all programs	Comm. Dir.	Outreach Effort Index

Overarching Issues	National Priorities P=Protect C=Conserve E=Enhance	Programs Involved State & Private Forestry Programs* SCFC Programs	Reporting Position that Tracks Progress	Performance Measures Individual Measures and Performance Indices
Action 4.4.2: Maintain and improve relationships with elected officials statewide.	P, C, E	all programs	Comm. Dir.	Outreach Effort Index
Strategy 6. Provide accurate and timely information on the inventory, utilization, and health of South Carolina's forests.				
Resources Needed: Funding for personnel, equipment, and operating; Support of partner (USFS-FIA)				
Action 4.6.1: Maintain the state's Forest Inventory and Analysis (FIA) program to quantify forest inventory and health.	C, P	FIA	FIA Coord.	% Expected FIA Plot Production, FIA Program QA/QC score,
Issue 3: Climate Change				
Strategy 5. Promote trees and forests as a way to offset the effects of a changing climate.				
Resources Needed: Funding for marketing programs to promote wood use. Funding for Project Foresters, technology, and support staff; Training; Partner engagement (NRCS, FSA, et.al.)				
Action 4.5.1: Provide technical assistance to forest landowners.	P, C, E	Stewardship*, BMP, Forest Health*	Forest Mgmt Chief	NWOS Intensification, % new landowners, # of Landowners assisted, Forest Management Effort Index, Landowner Satisfaction
Action 4.5.2: Monitor and disseminate information related to climate change mitigation.	P, C, E	Stewardship*, Comm., BMP, Forest Health*, UCF*	Forest Mgmt Chief	Outreach Effort Index, % Expected FIA Plot Production
Action 4.5.3: Encourage the use of solid wood products.	E	Resource Dev., Comm.	Res. Dev. Div. Director	Outreach Effort Index
Strategy 6. Provide accurate and timely information on the inventory, utilization, and health of South Carolina's forests.				
Resources Needed: Funding for personnel, equipment, and operating; Support of partner (USFS-FIA)				
Action 4.6.1: Maintain the state's Forest Inventory and Analysis (FIA) program to quantify forest inventory and health.	C, P	FIA	FIA Coord.	% Expected FIA Plot Production, FIA Program QA/QC score,
*indicates programs that are part of the USDA Forest Service State & Private Forestry consolidated grant				
Programs: Fire, Forest Health, UCF - Urban & Community Forestry; Stewardship - Forest Stewardship program; FIA - Forest Inventory & Analysis; WUI - Wildland Urban Interface; Forest Legacy (DNR); Comm. - Communications & Public Information; Tree Imp. - Nursery & Tree Improvement; Law Enf. - Law Enforcement; State Lands - State Forests & Other State Lands				

Strategy Matrix

Goals, Strategies and Action Items	National Priorities P=Protect C=Conserve E=Enhance	Programs Involved State & Private Forestry Programs* SCFC Programs	Reporting Position that Tracks Progress	Performance Measures Individual Measures and Performance Indices
Goal 1 – Enhance Public Benefits from Trees and Forests				
This goal aims to increase the full range of benefits from South Carolina's forests – including healthy and growing markets, new jobs, clean water, clean air, wildlife habitat, recreation, natural beauty, health benefits, and more.				
Strategy 1. Promote forestry programs and practices that safeguard South Carolina's water, air, soil, wildlife habitat, recreation, and natural beauty.				
Resources Needed: Personnel time, broad industry engagement and support, MOU with partners, landowner education.				
Action 1.1.1: Work with partners to promote active management of forests, including bottomland hardwood areas/riparian forest corridors.	E, C	BMP, Stewardship*, State Lands, Comm.	Forest Mgmt Chief	Overall BMP Compliance Rate, Total number of site visits, Total number of active partnerships with outside organizations
Action 1.1.2: Partner with water utilities on source water protection.	E, C	BMP	Env. Program Mgr	Overall BMP Compliance Rate, Total number of active partnerships.
Action 1.1.3: Promote mechanisms to compensate landowners for ecosystem services	E, C	BMP, State Lands	Env. Program Mgr	Total number of active forestry-related ecosystem service projects supported through technical assistance.
Action 1.1.4: Enhance water quality protection by increasing awareness and compliance with SC Best Management Practices (BMPs).	E, C	BMP, Stewardship*, Comm., State Lands	Env. Program Mgr	Overall BMP Compliance Rate, Total number of active partnerships.
Action 1.1.5: Work with partners to promote management of forestland for recreation and aesthetic benefits.	P, C, E	Stewardship, Comm., State Lands	Forest Mgmt Chief	Outreach Effort Index, # of Other State Lands Assists
Strategy 2. Deliver programs and services that retain, develop, and expand sustainable timber and non-timber markets.				
Resources Needed: Personnel time, funds for certification fees and dues				
Action 1.2.1: Promote third-party certification – e.g. Tree Farm, SFI, FSP	E, C	Stewardship*, State Lands, Comm.	Forest Mgmt Chief	Outreach Effort Index, Acres of Certified Forestland
Action 1.2.2: Actively market South Carolina forest products nationally and internationally.	E, C	Resource Dev., Comm.	Res. Dev. Div. Director	Outreach Effort Index, Forest Markets Development Index,

	National Priorities	Programs Involved	Reporting	Performance Measures
Goals, Strategies and Action Items	**P=Protect C=Conserve E=Enhance**	**State & Private Forestry Programs* SCFC Programs**	**Position that Tracks Progress**	**Individual Measures and Performance Indices**
Action 1.2.3: Maintain the state's Forest Inventory and Analysis (FIA) program to quantify forest inventory and health.	C, P	FIA	FIA Coord.	% Expected FIA Plot Production, FIA Program QA/QC score
Action 1.2.4: Promote, develop and expand forestry-related industry in the state.	E, C	Resource Dev., Comm.	Res. Dev. Div. Director	Outreach Effort Index, Forest Markets Development Index,
Strategy 3. Engage communities to grow and sustain healthy trees and forests.				
Resources Needed: Training, stakeholder engagement, coordination with Communications staff, funding for pass-through grants				
Action 1.3.1: Administer the community forestry grant program as available and provide information on other available sources of grants and funding to assist in the development and management of public trees and forests.	E	UCF*	UCF Coord.	Community Forestry Index
Action 1.3.2: Provide technical assistance and training to help manage urban trees.	E, P	UCF*, Forest Health*	UCF Coord.	Community Forestry Index
Action 1.3.3: Educate communities on the benefits of urban trees, including health benefits.	E	UCF*, Comm.	UCF Coord.	Outreach Effort Index, Community Forestry Index
Action 1.3.4: Recognize communities for successful urban forestry programs (e.g. Tree City USA).	E	UCF,* Comm.	UCF Coord.	Outreach Effort Index, Community Forestry Index
Strategy 4. Engage in tree improvement to improve the health and productive capacity of our forests.				
Resources Needed: Maintain staffing with specialized expertise in tree improvement				
Action 1.4.1: Produce seed in sufficient quantity and quality for nursery needs.	E, C	Tree Imp., State Lands	Res. Dev. Div. Director	
Action 1.4.2: Maintain tree improvement cycle as directed by NC Tree Improvement Network.	E, C	Tree Imp., State Lands	Res. Dev. Div. Director	
Goal 2 – Protect Forests from Harm				
This goal aims to protect lives and property from wildfire, decrease wildfire risk and damage, mitigate threats to forest health, and respond to				
disasters.				
Strategy 1. Ensure prompt and effective response to wildfires and other disasters in an increasingly complex environment.				
Resources Needed: Funding for firefighters and equipment, training, cooperative agreements with partners				
Action 2.1.1: Provide safe, reliable, and effective equipment to partner agency and SCFC wildland firefighters.	P, C	Fire*	Forest Protection Chief	Readiness Index
Action 2.1.2: Provide staffing levels and training to ensure a sufficient and skilled firefighting workforce.	P, C	Fire*, State Lands	Forest Protection Chief	Readiness Index
Action 2.1.3: Continuously improve dispatch and communications systems.	P	Fire*	Technology Div. Director	Readiness Index
Action 2.1.4: Ensure that personnel follow safe work procedures.	P	Fire*	Trng & Safety Mgr	

Goals, Strategies and Action Items	National Priorities P=Protect C=Conserve E=Enhance	Programs Involved State & Private Forestry Programs* SCFC Programs	Reporting Position that Tracks Progress	Performance Measures Individual Measures and Performance Indices
Strategy 2. Develop and deliver innovative prevention programs that reduce wildfire risks to forests and communities.				
Resources Needed: Funding for prevention personnel, fuels mitigation work, and prevention education				
Action 2.2.1: Assess risk to communities and work with leaders to reduce threats.	P, C, E	Fire*, UCF*	FireWise Coord.	Wildfire Prevention Index
Action 2.2.2: Reduce fuel loadings in forested areas near communities.	P, C	Fire*, State Lands	FireWise Coord.	Wildfire Prevention Index
Action 2.2.3: Increase public awareness of wildfire risk and actions to help reduce risk.	P, C	Fire*, Comm., Stewardship*	Comm. Dir.	Outreach Effort Index, Wildfire Prevention Index
Strategy 3. Deliver law enforcement services to reduce wildfire risks, illegal dumping, and forest product theft and fraud.				
Resources Needed: Funding for officers/training, cooperative agreements with partner agencies				
Action 2.3.1: Provide staffing levels and training to ensure a sufficient and skilled law enforcement workforce.	P	Fire*, Law Enf., State Lands	LE Chief	Wildfire Prevention Index, # of violations vs prosecutions, # of Class 1 Officers; # of investigations
Action 2.3.2: Work with partner organizations to coordinate efforts and ensure maximum efficiency.	P	Fire*, Law Enf., State Lands	LE Chief	Wildfire Prevention Index, # of joint investigations, # participating in regional LE Task Force meetings, # of CJA instructors
Strategy 4. Deliver programs and services to prevent and reduce damage from insects, diseases, invasive species, and other threats to our forests.				
Resources Needed: Funding for detection, education and response to threats, agreements with partners, training for field staff				
Action 2.4.1: Utilize EDRR (Early Detection, Rapid Response) process to address forest health threats.	P, C, E	Forest Health*, UCF*, State Lands	Forest Health Coord.	Forest Health Prevention Index
Action 2.4.2: Raise awareness by forest landowners of forest health threats.	P, C, E	Forest Health*, Comm., Stewardship*	Forest Health Coord.	Outreach Effort Index, Forest Health Prevention Index
Action 2.4.3: Provide training to agency personnel and cooperators on issues related to forest health.	P, C, E	Forest Health*, UCF*	Forest Health Coord.	Forest Health Prevention Index
Action 2.4.4: Administer Southern Pine Beetle cost-share program.	P, C	Forest Health*, Stewardship*	Forest Health Coord.	Forest Health Prevention Index
Goal 3 – Conserve Working Forests				
This goal aims to ensure the sustainability and active management of South Carolina's forests, in order to maintain the economic, environmental, and societal benefits these lands provide.				
Strategy 1. Support landowners with programs and services that promote active forest management and help them meet their goals.				
Resources Needed: Funding for Project Foresters, technology, and support staff; Training; Partner engagement (NRCS, FSA, et.al.)				
Action 3.1.1: Promote and manage federal, state, and private cost-share programs.	C	Stewardship*, Comm.	Forest Mgmt Chief	Outreach Effort Index, # of Landowners assisted, Forest Management Effort Index, Landowner Satisfaction
Action 3.1.2: Provide technical assistance to forest landowners.	C, P	Stewardship*, Comm., Forest Health*, BMP	Forest Mgmt Chief	NWOS Intensification, % of new landowners, # of Landowners assisted, Forest Management Effort Index, Landowner Satisfaction
Action 3.1.3: Conduct monitoring to measure effectiveness of agency programs.	C	Stewardship*	Forest Mgmt Chief	Landowner Satisfaction, Forest Management Effort Index

	National Priorities	Programs Involved	Reporting	Performance Measures
Goals, Strategies and Action Items	**P=Protect C=Conserve E=Enhance**	**State & Private Forestry Programs* SCFC Programs**	**Position that Tracks Progress**	**Individual Measures and Performance Indices**
Action 3.1.4: Provide training for foresters and others to expand their knowledge base and improve delivery of technical assistance.	C, E	Stewardship*, BMP, WUI	Forest Mgmt Chief	Use of ArcGIS, # of Seat Hours of Training
Action 3.1.5: Promote use of conservation easements and other tools designed to retain working forests	C, P	Stewardship*, Comm., Forest Legacy*, State Lands	Forest Mgmt Chief	Outreach Effort Index, Forest Legacy Projects
Action 3.1.6: Work with agency partners to share information and coordinate initiatives	P, C, E	Stewardship*, BMP, WUI, Forest Health*	Forest Mgmt Chief	# of Partners Engaged
Strategy 2. Promote and increase the responsible use of prescribed fire.				
Resources Needed: Support of partners (FASC, USFS, et.al.); Funding for tools, equipment, and personnel				
Action 3.2.1: Provide training for the prescribed fire community.	P, C, E	Fire*, State Lands	Training Coord.	# of CPFM classes offered, % of acres burned conducted by CPFM burners
Action 3.2.2: Promote the benefits of prescribed burning to retain social license to burn.	P, C, E	Fire*, Comm., WUI, Stewardship*, Forest Health*, State Lands	Comm. Dir.	Outreach Effort Index, Wildfire Suppression Index, Wildfire Prevention Index, Customer Satisfaction
Action 3.2.3: Increase the resources available for prescribed burning.	P, C, E	Fire*, Comm., Stewardship*	Forest Protection Chief	# of CPFM classes offered, % of acres burned conducted by CPFM burners
Strategy 3. Demonstrate practices for the active, sustainable, multiple-use management of State Forests, and engage other public landowners to do the same.				
Resources Needed: Coordination among SCFC program areas; Support of partners (NWTF, DNR, Clemson, et.al.)				
Action 3.3.1: Actively demonstrate sustainable forestry practices on public lands.	P, C, E	Comm.*, State Lands, Forest Health*, BMP	State Lands Coord.	Outreach Effort Index, # of Demonstration Sites, Acres of Certified Forestland
Action 3.3.2: Host educational events for forest landowners and the public.	P, C, E	Comm.*, Stewardship*, Forest Health*, BMP, State Lands	State Lands Coord.	Outreach Effort Index, # of Events Held
Action 3.3.3: Make state forests available for research projects.	P, C, E	State Lands	State Lands Coord.	# of Current Research Projects
Strategy 4. Actively seek opportunities to acquire land to grow the State Forest system.				
Resources Needed: Funding for acquisition; Support of partners (Conservation Bank, DNR, et.al.)				
Action 3.4.1: Research strategically significant properties that may be available.	C, P	State Lands	State Lands Coord.	# of Properties Evaluated
Action 3.4.2: Seek and secure financial resources to make acquisitions.	C	State Lands, Forest Legacy*	State Lands Coord.	# of Funding Inquiries Made

	National Priorities	Programs Involved	Reporting	Performance Measures
Goals, Strategies and Action Items	**P=Protect C=Conserve E=Enhance**	**State & Private Forestry Programs* SCFC Programs**	**Position that Tracks Progress**	**Individual Measures and Performance Indices**
Goal 4 – Raise Awareness about Our Forests				
This goal aims to increase public knowledge of the benefits of forests and forest management, to make more people aware of the Forestry Commission and its work, and to establish SCFC as the most trusted source of information on South Carolina's trees and forests.				
Strategy 1. Promote the Forestry Commission as South Carolina's first and foremost source for forest management information and assistance.				
Resources Needed: Operating expenses for personnel and technology/equipment; training/continuing education; grant funding for statewide initiatives.				
Action 4.1.1: Provide educational programs for a variety of audiences.	P, C, E	all programs	Comm. Dir.	Outreach Effort Index
Action 4.1.2: Gather more feedback (focus groups, research)	P, C, E	Comm.	Comm. Dir.	Outreach Effort Index
Action 4.1.3: Increase use of unpaid media	P, C, E	all programs	Comm. Dir.	Outreach Effort Index
Strategy 2. Educate the public on the environmental benefits of working forests and the role of strong markets and family forest owners in keeping our forests healthy.				
Resources Needed: Operating expenses for specialized education personnel and technology/equipment; training/continuing education; support of partners; grant funding for special projects and statewide initiatives.				
Action 4.2.1: Provide educational programs for a variety of audiences.	P, C, E	all programs	Comm. Dir.	Outreach Effort Index, # of Programs, # of Participants
Action 4.2.2: Utilize conventional and social media to promote the value of sustainable forestry.	P, C, E	Comm.	Comm. Dir.	Outreach Effort Index
Action 4.2.3: Coordinate with partners to increase public engagement.	P, C, E	all programs	Comm. Dir.	Outreach Effort Index
Strategy 3. Continue to promote the economic benefits of forestry.				
Resources Needed: Operating expenses for specialized education personnel and technology/equipment; training/continuing education; support of partners; grant funding for special projects and statewide initiatives.				
Action 4.3.1: Provide educational programs for a variety of audiences.	P, C, E	all programs	Comm. Dir.	Outreach Effort Index, # of Programs, # of Participants
Action 4.3.2: Utilize conventional and social media to promote the value of sustainable forestry.	E,C	Comm.	Comm. Dir.	Outreach Effort Index
Action 4.3.3: Coordinate with partners to increase public engagement.	P, C, E	all programs	Comm. Dir.	Outreach Effort Index
Strategy 4. Engage stakeholders to maintain a forestry friendly business environment.				
Resources Needed: Operating expenses for specialized education personnel and technology/equipment; training/continuing education; support of partners; grant funding for special projects and statewide initiatives.				
Action 4.4.1: Engage in public policy discussions related to forestry.	P, C, E	all programs	Comm. Dir.	Outreach Effort Index
Action 4.4.2: Maintain and improve relationships with elected officials statewide.	P, C, E	all programs	Comm. Dir.	Outreach Effort Index
Strategy 5. Promote trees and forests as a way to offset the effects of a changing climate.				
Resources Needed: Knowledgeable personnel; support of partners, including legislators and other leaders in forest products sectors.				

	National Priorities	Programs Involved	Reporting	Performance Measures
Goals, Strategies and Action Items	**P=Protect C=Conserve E=Enhance**	**State & Private Forestry Programs* SCFC Programs**	**Position that Tracks Progress**	**Individual Measures and Performance Indices**
Action 4.5.1: Provide technical assistance to forest landowners.	P, C, E	Stewardship*, BMP, Forest Health*	Forest Mgmt Chief	NWOS Intensification, % new landowners, # of Landowners assisted, Forest Management Effort Index, Landowner Satisfaction
Action 4.5.2: Monitor and disseminate information related to climate change mitigation.	P, C, E	Stewardship*, Comm., BMP, Forest Health*, UCF*	Forest Mgmt Chief	Outreach Effort Index, % Expected FIA Plot Production
Action 4.5.3: Encourage the use of solid wood products.	E	Resource Dev., Comm.	Res. Dev. Div. Director	Outreach Effort Index
Strategy 6. Provide accurate and timely information on the inventory, utilization, and health of South Carolina's forests.				
Resources Needed: fully staffed FIA crews; operating expenses; personnel; broad industry engagement and support; MOU with partners; landowner education.				
Action 4.6.1: Maintain the state's Forest Inventory and Analysis (FIA) program to quantify forest inventory and health.	C, P	FIA	FIA Coord.	% Expected FIA Plot Production, FIA Program QA/QC score,

*indicates programs that are part of the US Forest Service State & Private Forestry consolidated grant

Programs: Fire, Forest Health, UCF - Urban & Community Forestry; Stewardship - Forest Stewardship program; FIA - Forest Inventory & Analysis; WUI - Wildland Urban Interface; Forest Legacy (DNR); Comm. - Communications & Public Information; Tree Imp. - Nursery & Tree Improvement; Law Enf. - Law Enforcement; State Lands - State Forests & Other State Lands

Overarching Issues

Population Growth

The population of South Carolina is predicted to grow from five million in 2020 to over six million by 2030. As the population grows, more forest land will be converted to housing and commercial development, stormwater runoff will increase, public demand on forest attributes will rise, and the number of wildfires that threaten structures will increase.

Climate Change

Increased incidence of droughts and storms, increased number and severity of wildfires, and more numerous and severe insect and disease outbreaks are possible if climate change predictions hold true. Sustainable management of forests can help reduce the negative effects of this change.

Public Perceptions about Forestry

Many South Carolina residents value the environmental role of forests, such as protecting water quality, as more important than their role as the provider of raw materials for the number one manufacturing industry in the state. With increased urbanization, many citizens also do not have a close connection with the land. As a consequence, restrictive regulations such as outdoor burning ordinances and tree protection ordinances are proposed with little or no consideration of the potential effects of this legislation on forestry operations.

Goal: Mitigate the potentially negative effects of population growth and climate change and encourage the public to adopt a more favorable attitude about forestry.

Note: Many of the objectives and strategies listed here are repeated elsewhere in this document because of the all-inclusive nature of these issues.

Conserving South Carolina's Working Forests

Emerging Markets

Carbon credits, biomass, and other products of the forests of South Carolina are expected to become more important as issues such as climate change and the need for energy independence gain momentum on the federal level. Savvy landowners will position themselves to take advantage of these emerging markets, which may even enable some of them to retain ownership of their land. In addition, current markets for forest products need to be expanded to provide economic incentives for landowners to actively manage their forestland.

Forest Regulation

In many cases, forest regulation can be a disincentive for forest landowners to actively manage their forests and may be an incentive to convert their forestland to another use. Regulation can take the form of ordinances, taxes, and legislation such as the Endangered Species Act. Some forms of taxation, however, such as lower property tax rates for forested tracts, have a favorable effect on forest management.

Fragmentation and Parcelization

As South Carolina's population grows, forested tracts of land continue to become fragmented by the addition of roads, power lines, and buildings. Many larger tracts are also being subdivided into parcels that make traditional forest management difficult to accomplish. This trend has implications for the long-term sustainability of the forest resources of South Carolina.

Goal: Ensure the sustainability and active management of South Carolina's forests, in order to maintain the economic, environmental, and societal benefits these lands provide.

Protecting South Carolina's Forests from Harm

Prescribed Burning

Forest managers in South Carolina conduct prescribed burns on about 525,000 acres each year. Experts agree that nearly twice this amount needs to receive this treatment, but obstacles such as smoke management and liability concerns, fragmentation of forest land, and changing attitudes about prescribed burning make increasing the amount of acreage burned a major challenge.

Wildfire Risk

Nearly 3,000 wildfires occur each year in South Carolina, two-thirds of which originate from escaped debris burns or are deliberately set. With the growth in the state's population, more and more of these fires damage not only timber and wildlife habitat, but also homes and other structures.

Forest Health Threats

The threats to the health of the forests in South Carolina include native, non-native but naturalized, and non-native plants, diseases, and insects. The three most significant threats to South Carolina's forests currently are southern pine beetle, Sirex wood wasp, and cogongrass. They are important because of their potential economic, aesthetic, and ecological impacts.

Goal: Protect lives and property from wildfire, decrease wildfire risk and damage, mitigate threats to forest health, and respond to disasters.

Enhancing the Benefits of South Carolina's Trees and Forests

Water Quality and Quantity

Surface water that is free from pollutants and sediment, and provides habitat requirements for wildlife, is considered to be of high quality. Forestry operations generally have little detrimental effect on water quality. Nevertheless, the South Carolina Forestry Commission, cooperating with the South Carolina Department of Health and Environmental Control, aggressively promotes adherence to Best Management Practices. South Carolina has an abundant supply of freshwater, but is not immune to water quantity issues as evidenced by recent legal action involving neighboring states.

Stormwater Management

Impervious surfaces such as roads, roofs, driveways, streets, and parking lots increase not only stormwater volume, but also the rate of flow. Maintenance and expansion of urban canopy cover is an effective tool that can be used to reduce the impacts of stormwater runoff.

Source Water Protection

Source water protection is a proactive approach to safeguard, maintain, or improve the quality and/or quantity of drinking water sources and their contributing areas. Effectively managing the areas through which water travels and the activities that occur in those areas helps protect the quality and quantity of available drinking water.

Air Quality

South Carolina's forests play a major role in filtering the air of pollutants such as ozone and particulate matter. In addition, trees sequester carbon dioxide and emit oxygen through the process of photosynthesis.

Community Forests in South Carolina

Trees are major capital assets in communities. The quantity, placement and size of trees in populated places can positively impact and provide millions of dollars in savings regarding energy conservation, air filtration, stormwater runoff mitigation, and carbon dioxide sequestration.

Goal: Increase the full range of benefits from South Carolina's forests – including healthy and growing markets, new jobs, clean water, clean air, wildlife habitat, recreation, natural beauty, health benefits, and more.

SC Forestry Commission Programs

Rural Forestry Assistance and Forest Stewardship

Rural Forestry Assistance and the Forest Stewardship Program were established by the Cooperative Forestry Assistance Act of 1978. Rural Forestry Assistance establishes a cooperative program between USDA and States to provide technical information, advice, and related assistance to private landowners and other entities within the forest management community to encourage conservation and management of non-Federal forests. The Forest Stewardship Program focuses specifically on nonindustrial private forest lands by assisting owners of these lands to more actively manage their forests for multiple uses and values based on a Forest Stewardship Plan and using available expertise and assistance. Grant funds are made available to South Carolina Forestry Commission under the legislative authority of the Cooperative Forestry Assistance Act of 1978 (as amended) and various appropriation acts.

Priority Area: Conserve Working Forests

Goals, Strategies, and Action Items

Goal 1
- Strategy 1 – Actions 1.1.1, 1.1.4, 1.1.5
- Strategy 2 – Action 1.2.1

Goal 2
- Strategy 2 – Action 2.2.3
- Strategy 4 – Actions 2.4.2, 2.4.4

Goal 3
- Strategy 1 – Actions 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.1.5, 3.1.6
- Strategy 2 – Actions 3.2.2, 3.2.3

Goal 4
Strategy 2 – Action 4.2.1
Strategy 4 – Actions 4.4.1, 4.4.2
Strategy 5 – Actions 4.5.1, 4.5.2

Performance Measures

Desired outcome is greater informed management as indicated by the number of forest management plans written (number), implementation of Forest Stewardship Plans (%), implementation of Forest Stewardship Plans in priority areas (acres), number of landowners assisted (number), acres assisted on other state lands (acres), number of consultant-written plans (Forest Stewardship) (number), number of Memorandum of Understandings with other agencies (number), number of referrals to consulting foresters (number), number of current plans (Forest Stewardship and FRP) (number), and number of landowners that indicated on seedling survey that they worked with a SC Forestry Commission forester (%).

Resources Needed

Funding for program development, outreach, and staffing. Technology transfer.

Nursery and Tree Improvement

The South Carolina Forestry Commission operates two Nursery & Tree Improvement (N&TI) facilities: Taylor Nursery in Edgefield County and Niederhof Forestry Center in Jasper County. The goal of the N&TI Program is to provide landowners with the highest-quality seed and seedlings available for timber production, wildlife habitat improvement, Christmas tree production, and restoration of valuable forested ecosystems. Taylor Nursery has the capacity of growing 20-25 million bareroot seedlings and 2.5 million containerized seedlings. Niederhof Forestry Center has over 130 acres of second generation loblolly pine orchards and 25 acres of third generation loblolly pine orchards. Longleaf orchard expansion will increase the availability of elite longleaf seedlings for forest landowners. The N&TI program conducts a customer satisfaction survey annually as a means of tracking performance improvement.

Priority Area: Conserve Working Forests

Goals, Strategies, and Action Items

Goal 1
Strategy 4 – Actions 1.4.1, 1.4.2
Goal 4
Strategy 2 – Actions 4.2.1, 4.2.3
Strategy 3 – Actions 4.3.1, 4.3.3
Strategy 4 – Actions 4.4.1, 4.4.2

Performance Measures

Desired outcomes are customers satisfied with the product (% satisfaction of customers that self-report), revenues meet or exceed costs (over 5-year period), and Performance Rating System (PRS) comparable with that available from other sources.

Resources Needed

Funding and staffing to enable the SC Forestry Commission to re-join the NC State Tree Improvement Cooperative as full members.

Resource Development

The goal of the Resource Development Program is to increase the contribution that forest resources, forest products, and forest product-related businesses make to South Carolina's economy. The agency accomplishes this goal by producing accurate and timely forest resource inventory data and working with existing and prospective companies in identifying opportunities for expansion.

Priority Area: Enhance Public Benefits from Trees and Forests

Goals, Strategies, and Action Items

Goal 1
Strategy 2 – Actions 1.2.2, 1.2.4
Goal 4
Strategy 2 – Actions 4.2.1, 4.2.3
Strategy 3 – Actions 4.3.1, 4.3.3
Strategy 4 – Actions 4.4.1, 4.4.2
Strategy 5 – Action 4.5.3

Performance Measures

Success is measured in the long-term sustainability of the forest resource, the amount of new capital investment in forestry-related business, and the number of jobs created through business expansion. Efforts are leveraged for more impact through partnerships that have been developed with state and local economic development organizations.

Resources Needed

Funding for marketing, program development, and

outreach. Also, funding for additional staffing.

Forest Inventory and Analysis

The Forest Inventory and Analysis (FIA) program is a joint cooperative program with the USDA Forest Service in which the South Carolina Forestry Commission collects forest inventory data on a network of plot locations. The data collected is then furnished to the Forest Service for analysis on a statewide, as well as, on a national basis.

The Forest Inventory and Analysis section collects forest measurements on a network of 3,491 plots located throughout South Carolina. During this year, plots are measured in 20 percent increments of the total number of plots for mensurational, growth projections, damage assessments, and land use classification. The South Carolina Forestry Commission employs six full-time employees to collect data. One full-time coordinator oversees all measurement operations.

In addition, the Forest Inventory and Analysis program collects forest health data on a network of 204 FIA plot locations throughout the South Carolina. During the summer, 20 percent of the total plots are measured for mensurational, health, soil chemistry, lichens, and related parameters. In addition, separate bioindicator plot samples will be established or previously established locations will be used to detect the presence of ozone pollution.

Priority Area: Conserve Working Forests

Goals, Strategies, and Action Items

Goal 1
- Strategy 2 – Action 1.2.3

Goal 4
- Strategy 2 – Actions 4.2.1, 4.2.3
- Strategy 3 – Actions 4.3.1, 4.3.3
- Strategy 4 – Actions 4.4.1, 4.4.2

Performance Measures

Desired outcome is meeting the required federal standards (completing 20% per year and meeting accuracy standards). Metric is accurate (80% accuracy) and timely (20% or more per year) data gathered in FIA and TPO (Timber Products Output) survey.

Resources Needed

Funding for three FIA crews for South Carolina and for support, equipment, and vehicles.

State Fire Assistance

The State Fire Assistance (SFA) Program is a component of the Cooperative Fire Protection Program and is authorized by Congress through the Cooperative Forestry Assistance Act of 1978, (PL 95-313 as amended). Funds are distributed to State Foresters based on recognition of the minimum need for all states to maintain and enhance coordination and communication with federal agencies. Funds provide financial assistance, technical training, and equipment to ensure Federal, State, and local fire agencies can deliver a coordinated response to wildfire.

The goal of the State Fire Assistance Program in South Carolina is to protect the state's communities, especially within the Wildland-Urban Interface, and timberland from significant loss of economic, ecological, or aesthetic value due to wildfire. This is in the spirit of the agency's mission of protecting and conserving the forestlands while preventing and suppressing wildfires. The emphasis is on improving fire planning, initial attack capabilities (primarily equipment and communications), knowledge and use of the Incident Command System, and wildfire technical training for local fire agencies.

Priority Area: Wildfire Risk

Goals, Strategies, and Action Items

Goal 2
- Strategy 1 – Actions 2.1.1, 2.1.2, 2.1.3, 2.1.4
- Strategy 2 – Actions 2.2.1, 2.2.2, 2.2.3
- Strategy 3 – Actions 2.3.1, 2.3.2

Goal 4
- Strategy 2 – Actions 4.2.1, 4.2.3
- Strategy 3 – Actions 4.3.1, 4.3.3
- Strategy 4 – Actions 4.4.1, 4.4.2

Performance Measures

Desired outcome is a positive five-year trend in each of the following metrics: 1) reduction in the number of structures lost to wildfire; 2) reduction in average fire size 3) increase in the number of hours of training conducted; 4) increase in the number of local fire departments that have received wildfire training; 5) evidence of cooperative agreements with non-traditional partners; and 6) decrease in the number of work time loss incidents per hundred fires.

Resources Needed

Funding for personnel to suppress wildfires as well wildfire suppression equipment.

National Fire Plan, State Fire Assistance

The National Fire Plan, State Fire Assistance Program is a component of the Cooperative Fire Protection Program and is authorized by Congress through the Department of Interior and Related Agencies Appropriation. Funds are distributed to State Foresters based on recognition of the minimum need for all states to maintain and enhance coordination with federal agencies. Fifty percent of these funds are to provide financial assistance for preparedness efforts; technical training and equipment to ensure Federal, State and local fire agencies can deliver a coordinated response to wildfire. The remaining fifty percent of these funds are to provide financial assistance to administer and implement wildfire hazard mitigation activities. Mitigation activities fall within the categories of:

- Fire prevention and education
- Community fire protection planning
- Wildfire hazard reduction treatments

The goal of the National Fire Plan, State Fire Assistance Program in South Carolina is to *protect the state's communities and timberland from significant loss of economic, ecological, or aesthetic value due to wildfire and to reduce the threat to communities from the impacts of wildland fire*. The emphasis is on improving fire prevention, community wildfire planning, and reducing wildfire risk through hazard reduction treatments.

Priority Area: Wildfire Risk

Objectives and Strategies

-- same as for State Fire Assistance above --

Performance Measures

Desired outcome is a positive five-year trend in each of the following metrics: 1) reduction in the number of structures lost to wildfire; 2) increase in the number of FireWise communities; 3) increase in the number of CWPPs; 4) increase in the number of local fire departments that have received wildfire training; and 5) evidence of cooperative agreements with non-traditional partners.

Resources Needed

Funding for personnel to conduct assessments, design plans, and deliver training.

Forest Health

Through the Forest Health Program, the SC Forestry Commission monitors, reports, and coordinates suppression of endemic pests affecting forest trees in South Carolina. The agency also works closely with Christmas tree growers, forest tree nurseries, seed orchards, and municipalities to manage forest health problems. It also operates a laboratory that provides free diagnosis of insects and diseases. The SC Forestry Commission maintains close working relations with the USDA Forest Service and other federal and state agencies such as Clemson University's Department of Plant Industries.

Priority Area: Threats to Forest Health

Goals, Strategies, and Action Items

Goal 1
- Strategy 3 – Actions 1.3.2

Goal 2
- Strategy 4 – Actions 2.4.1, 2.4.2, 2.4.3, 2.4.4

Goal 3
- Strategy 1 – Actions 3.1.2, 3.1.6
- Strategy 2 – Action 3.2.2
- Strategy 3 – Actions 3.3.1, 3.3.2

Goal 4
- Strategy 2 – Actions 4.2.1, 4.2.3
- Strategy 3 – Actions 4.3.1, 4.3.3
- Strategy 4 – Actions 4.4.1, 4.4.2
- Strategy 5 – Actions 4.5.1, 4.5.2

Performance Measures

Desired outcome is a positive five-year trend in each of the following metrics: 1) early detection and rapid response to forest pest problems as indicated by the prevention of new invasive species becoming established 2) number of workshops conducted, number of educational materials distributed, and positive responses to participant surveys (how useful they have found information); and 3) response time from the time at which Forest Health Section is notified or detects a forest pest until a recommendation is made.

Resources Needed

Cooperators, projects with other agencies in South Carolina, funding for personnel and equipment, technology to assist with data collection and analysis.

Water Quality (Best Management Practices)

The SC Forestry Commission coordinates a statewide Best Management Practices (BMP) Program for forestry-related activities. This program utilizes a proactive approach to help prevent non-point source pollution

through offering voluntary courtesy BMP exams to forest landowners, foresters, and forestry operators. Specially trained BMP Foresters locate ongoing forestry operations incidentally, through regular flights of high-priority watersheds, voluntary notification, and complaint calls. Courtesy BMP exams are offered to landowners, foresters, and forestry operators, providing them with site-specific recommendations regarding BMP implementation that can be included in timber sale contracts and implemented on active sites. Regular site inspections are performed throughout the forestry operation and once completed, a final on-site inspection is conducted to determine if the appropriate BMPs were implemented on the site. On sites where damage has already occurred, recommendations for mitigating the damage are made. A monthly summary report of completed courtesy BMP exams is provided to SCDHEC and forest industry, indicating whether BMPs were properly implemented or not and if any water quality impacts occurred as a result of the forestry activity. BMP Foresters conduct BMP training throughout the state, including the Timber Operating Professional (TOP Program) course.

Priority Area: Threats to Water Quality

Goals, Strategies, and Action Items

Goal 1
- Strategy 1 – Actions 1.1.1, 1.1.2, 1.1.3, 1.1.4
- Strategy 3 – Actions 1.3.2

Goal 3
- Strategy 1 – Actions 3.1.2, 3.1.4, 3.1.6
- Strategy 2 – Action 3.2.2
- Strategy 3 – Actions 3.3.1, 3.3.2

Goal 4
- Strategy 2 – Actions 4.2.1, 4.2.3
- Strategy 3 – Actions 4.3.1, 4.3.3
- Strategy 4 – Actions 4.4.1, 4.4.2
- Strategy 5 – Actions 4.5.1, 4.5.2

Performance Measures

Desired outcome is increased awareness and compliance with BMPs as shown by training participation, courtesy exam requests, requests for assistance, and continued high level of compliance as evidenced by monitoring.

Resources Needed

Adequate staffing to carry out program implementation, funding for aerial detection, and funding for field equipment.

Urban and Community Forestry Assistance

The Urban and Community Forestry Assistance (U&CF) program provides technical and financial assistance to local governments and others to plan urban forestry programs and to plant, protect, and improve urban forests and associated natural resources. The goal of the U&CF Assistance Program is to create, enhance and support long-term local, regional and statewide community forestry programs. *The active management of trees, forests and greenspaces contributes to clean air and water and energy conservation, reduces the impact of urbanization, mitigates the heat island effect, and reduces risk of tree failure during catastrophic events, among other things*.

The SC Forestry Commission will work with public and private partners to address and implement the issues and action items within the state's five-year strategic plan (revised in July 2006). Some of those strategies listed in the U&CF section of the plan include:

- Encourage those responsible for tree management within community settings to become certified under ISA's accreditation program.
- Encourage and assist county and municipal governments in the development of tree inventories, management plans and/or vegetation ordinances.
- Encourage opportunities for training and continuing education in arboriculture and community forestry.
- Promote the Tree City USA program and encourage interested communities to apply for Tree City status.

Priority Area: Community Forestry

Goals, Strategies, and Action Items

Goal 1
- Strategy 3 – Actions 1.3.1, 1.3.2, 1.3.3, 1.3.4

Goal 2
- Strategy 2 – Action 2.2.1
- Strategy 4 – Actions 2.4.1, 2.4.3

Goal 4
- Strategy 2 – Actions 4.2.1, 4.2.3
- Strategy 3 – Actions 4.3.1, 4.3.3
- Strategy 4 – Actions 4.4.1, 4.4.2
- Strategy 5 – Action 4.5.2

Performance Measures

Desired outcome is a sustained capacity for communities of place and communities of people to actively manage and care for trees and associated vegetation as measured by professional staff, tree/natural resource

inventory information and management plans, skilled and knowledgeable workers, recurring funding, tree management and conservation policies, and advocacy groups.

Resources Needed

Adequate and qualified staff to provide state-wide assistance, funding for cost-share grant programs, and logistical and administrative support to implement program components.

State Lands

The State Lands Forest Management Program was created to provide professional forest management assistance to South Carolina state agencies that own timberlands. Through this program, SC Forestry Commission foresters write or approve management plans for state-owned land, approve and coordinate forest products sales, and provide services such as timber marking and prescribed burning. Fees charged for this work are comparable to those the agency charges for services on private lands.

Priority Area: Conserve Working Forests

Goals, Strategies, and Action Items

- Goal 1
  - Strategy 1 – Action 1.1.1
  - Strategy 2 – Action 1.2.1
- Goal 2
  - Strategy 2 – Action 2.2.2
- Goal 3
  - Strategy 2 – Action 3.2.2
  - Strategy 3 – Actions 3.3.1, 3.3.2, 3.3.3
  - Strategy 4 – Actions 3.4.1, 3.2.4
- Goal 4
  - Strategy 1 – Action 4.1.1, 4.1.3
  - Strategy 2 – Actions 4.2.1, 4.2.3
  - Strategy 3 – Actions 4.3.1, 4.3.3
  - Strategy 4 – Actions 4.4.1, 4.4.2

Performance Measures

Desired outcome is an increase in the number of acres of forestland protected from development and retained as working forests as well as revenue generated per acre.

Resources Needed

Funding for acquisition of property and equipment, and for supporting technology and adequate resource management capacity.

Communication and Public Information

The Communication and Public Information (CPI) program of the SC Forestry Commission manages the dissemination of information for the agency and develops and conducts educational programs. To this end, CPI employees manage the agency's website, write news releases, respond to requests from the news media, conduct an annual Teacher's Tour, coordinate Project Learning Tree for South Carolina, and provide educational opportunities for schools at state forests. In addition, CPI and other agency employees work with other agencies to conduct joint educational programs such as the Envirothon, Woodlands Clinic, and FFA Forestry Career Development Event.

Priority Area: Combined Priority Area for the State

Goals, Strategies, and Action Items

- Goal 1
  - Strategy 1 – Actions 1.1.1, 1.1.4, 1.1.5
  - Strategy 2 – Actions 1.2.1, 1.2.2, 1.2.4
  - Strategy 3 – Actions 1.3.3, 1.3.4
- Goal 2
  - Strategy 2 – Action 2.2.3
  - Strategy 4 – Actions 2.4.2
- Goal 3
  - Strategy 1 – Actions 3.1.1, 3.1.5
  - Strategy 2 – Actions 3.2.2, 3.2.3
  - Strategy 3 – Actions 3.3.1, 3.3.2
- Goal 4
  - Strategy 1 – Actions 4.1.1, 4.1.2, 4.1.3
  - Strategy 2 – Actions 4.2.1, 4.2.2, 4.2.3
  - Strategy 3 – Actions 4.3.1, 4.3.2, 4.3.3
  - Strategy 4 – Actions 4.4.1, 4.4.2
  - Strategy 5 – Action 4.5.2, 4.5.3

Performance Measures

Desired outcomes are the identification of target audiences, development of appropriate materials, an increase in the number of educational programs conducted, and the number of participants in these programs. Metrics include description of target audiences, number of programs developed or updated, number of requests for educational programs, number of participants trained, and overall positive evaluations.

Resources Needed

Funding for the development of educational materials,

cooperator support, and adequate staffing to allow the development and delivery of information and programs.

Forest Legacy

The lead agency for the Forest Legacy Program in South Carolina is the SC Department of Natural Resources (DNR). The goal of this program is to conserve working forests and protect them from being converted to non-forest uses. The SCDNR has utilized this program to conserve critical wildlife habitat across the state while ensuring that traditional values and uses of forested areas continue to be available. When Forest Legacy came to South Carolina in 1999, DNR worked in consultation with the State Forest Stewardship Coordinating Committee (SFSCC) and the South Carolina Forestry Commission (SCFC) to develop an Assessment of Need (AON). Representatives from the SCDNR, SCFC, and SCFSCC were asked to serve on the Forest Legacy Subcommittee. The state grant option was selected in the AON. Under the State Grant Option, all Forest Legacy acquisitions shall be transacted by the state with the title vested in the state. Landowner participation is entirely voluntary. The subcommittee identified five Forest Legacy Areas in need of conservation and long-term forest management.

Priority Area: Conserve Working Forests

Goals, Strategies, and Action Items

Goal 3

Strategy 1 – Action 3.1.5

Strategy 4 – Action 3.4.2

Performance Measures

Desired outcome is for Forest Legacy to play a key role in supporting landscape conservation efforts and generate an increase in the number of acres of forestland protected from development and retained as working forests.

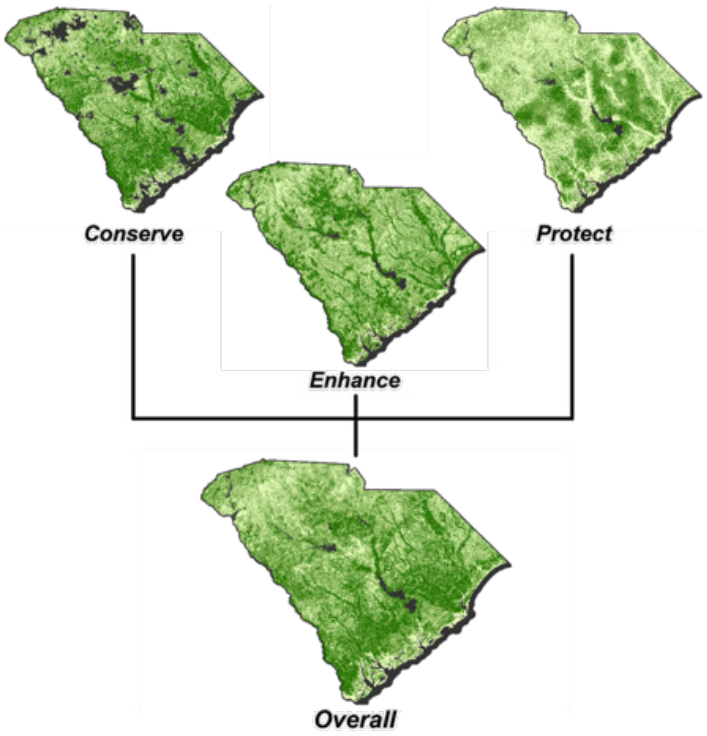
Resources Needed

Funding for acquisition of property and for administration of the Forest Legacy program.

APPENDIX 1
DEVELOPMENT OF PRIORITY AREAS

A required element of State Forest Resource Assessments is the delineation of priority landscape areas, both rural and urban, to be addressed by the State Resource Strategy. In South Carolina, priority areas have been developed to address issues identified within South Carolina's Statewide Forest Resource Assessment with the goal of focusing limited resources on areas where the greatest benefit can be achieved. To allow maximum flexibility during the development of strategies, priority areas have been developed at multiple levels based on the input of working group members (see Figure 1).

Figure 1. Hierarchy of spatial analyses for South Carolina's Statewide Forest Resource Assessment



Priority areas were developed using a series of spatial analyses using ESRI Geospatial Information Systems (GIS) software. Spatial analysis can be performed in many ways. To create priority areas for South Carolina's Statewide Forest Resource Assessment, weighted overlay analyses were primarily used. The general methodology utilized was as follows:

1. GIS staff identified all available data that could potentially relate to issues identified in South Carolina's Statewide Forest Resource Assessment. GIS staff was encouraged to use readily available data for all analyses due to the relatively short timeframe afforded states to complete their assessment. One major source of readily available data to southern states was the input data from the Southern Forest Land Assessment (SFLA).

2. Each working group was tasked with identifying the criteria to be used when determining areas of priority, the relative importance of these criteria for determining priority, and the level of analysis best suited for the issues being addressed by the working group. The following assumptions and questions were used by each working group to reach their consensus decisions:

a. Assumptions:
   i. There are limited resources: e.g., money and manpower.
   ii. All lands in the state must be served.
   iii. There is a need to focus resources on lands where maximum benefit, for the issue, can be achieved.

b. Questions:
   i. What criteria would you use to give priority to a landscape or individual piece of land? Criteria will most likely fit into: Indicators of Resource Richness or Threats to the Resource. Manythese criteria may be physical characteristics of the land.
   ii. Are criteria place-based or are they situational? Place-based criteria can be used to create maps of the issues. Situational criteria can be used to establish priority areas based on if/then scenarios.
   iii. Are issues different enough to require separate priority areas?

3. Criteria were matched to the best available GIS data and prepared for input into the overlay analysis. If criteria could not be adequately represented by an existing dataset, a new dataset was created if possible.

4. The input data layers for each analysis were weighted based on their relative importance and defined by the working groups. Weights were assigned such that they summed to 100.

5. Spatial overlay analyses were conducted at the working group level to produce the desired outputs for each working group. Working group outputs were

developed using weighted overlay analysis to create priority areas for National Themes. The National Theme priority areas were then combined using unweighted overlay analysis to create an Overall South Carolina state priority map.

6. Outputs were classified into three classes – high, medium, and low – using Jenks Natural Breaks. Priority areas were presented as the raw output of 30-meter pixel rasters.

Conserving Working Forests Working Group

The Conserving Working Forests Working Group addressed the issues of forest parcelization and fragmentation, forest regulation, emerging markets, and critical habitats. It was the consensus of the working group that these issues could be addressed by a single set of priority areas. The criteria used to determine priority areas, the data layers used to spatially represent the criteria, and the relative weighting of the data layers are shown in Table 1.

Table 1. Criteria, data layers, and relative weights used to create priority areas for the Conserving Working Forests Working Group

GIS Layer	Source	Layer Weight
Forestland	SFLA	28
Site Productivity	SFLA	28
Forest Patches	SFLA	10
Soils Drainage	NRCS	10
County Timber Product Output	SCFC	10
Threatened & Endangered Species	SFLA	5
Development	SFLA	5
Proximity to Public Land	SFLA	2
Longleaf Pine Range	USDA/NRCS	2

Results of the spatial analysis for the Conserving Working Forests Working Group yielded a single set of priority areas displayed in 30 meter pixel format (see page 105).

Protecting Forests from Harm Working Group

The Protecting Forests from Harm Working Group addressed the issues of wildfire risk and occurrence as well as potential threats to forest health and productivity from insects, diseases, and invasive plants. It was the consensus of the working group that these issues could be addressed by a single set of priority areas. The criteria used to determine priority areas, the data layers used to spatially represent the criteria, and the relative weighting of the data layers are shown in Table 2.

Table 2. Data layers, data sources and relative weights used to create priority areas for the Protecting Forests from Harm Working Group

GIS Layer	Source	Layer Weight
Wildfire Occurrence (2010-2020)	SCFC	30
Wildland Urban Interface Risk	SGSF WRAP	30
Southern Pine Beetle Hazard	NIDRM	27
Asian Longhorned Beetle Detection	SCFC	5
Emerald Ash Borer Detection	USDA	2
Hemlock Woolly Adelgid Range	SCFC	2
Oak Wilt Disease Detection	SCFC	2
Laurel Wilt Disease Detection	USDA	2
Longleaf Pine Range	USDA/NRCS	2

Results of the spatial analysis for the Protecting Forests from Harm Working Group yielded a single set of priority areas displayed in 30 meter pixel format (see page 106).

Enhancing Public Benefits from Trees and Forests Working Group

The Enhancing Public Benefits from Trees and Forests Working Group addressed the benefits of forests and trees through the analysis of watershed quality and quantity as well as timber production. It was the consensus of the working group that these issues could be addressed by a single set of priority areas. The criteria used to determine priority areas, the data layers used to spatially represent the criteria, and the relative weighting of the data layers are shown in Table 3.

Results of the spatial analysis for the Enhancing Public Benefits from Trees and Forests assessment yielded a single set of priority areas displayed in 30-meter pixel format (see page 107).

Table 3. Criteria, data layers, and relative weights used to create priority areas for the Enhancing Public Benefits from Trees and Forests Working Group

GIS Layer	Source	Layer Weight
Forestland	SFLA	14
Riparian Areas	SFLA	14
Priority Watersheds	SFLA	14
Forest Patches	SFLA	13
Public Drinking Water	SFLA	10
Forested Wetlands	SFLA	10
County Timber Product Output	SCFC	10
Slope	SFLA	5
Development	SFLA	5
Proximity to Mills	SCFC	5

Community Forestry Working Group

The Community Forestry Working Group addressed the issues of community forestry through the analysis of population trends and critical forest habitat. It was the consensus of the working group that these issues could be addressed by a single set of priority areas. The criteria used to determine priority areas, the data layers used to spatially represent the criteria, and the relative weighting of the data layers are shown in Table 4.

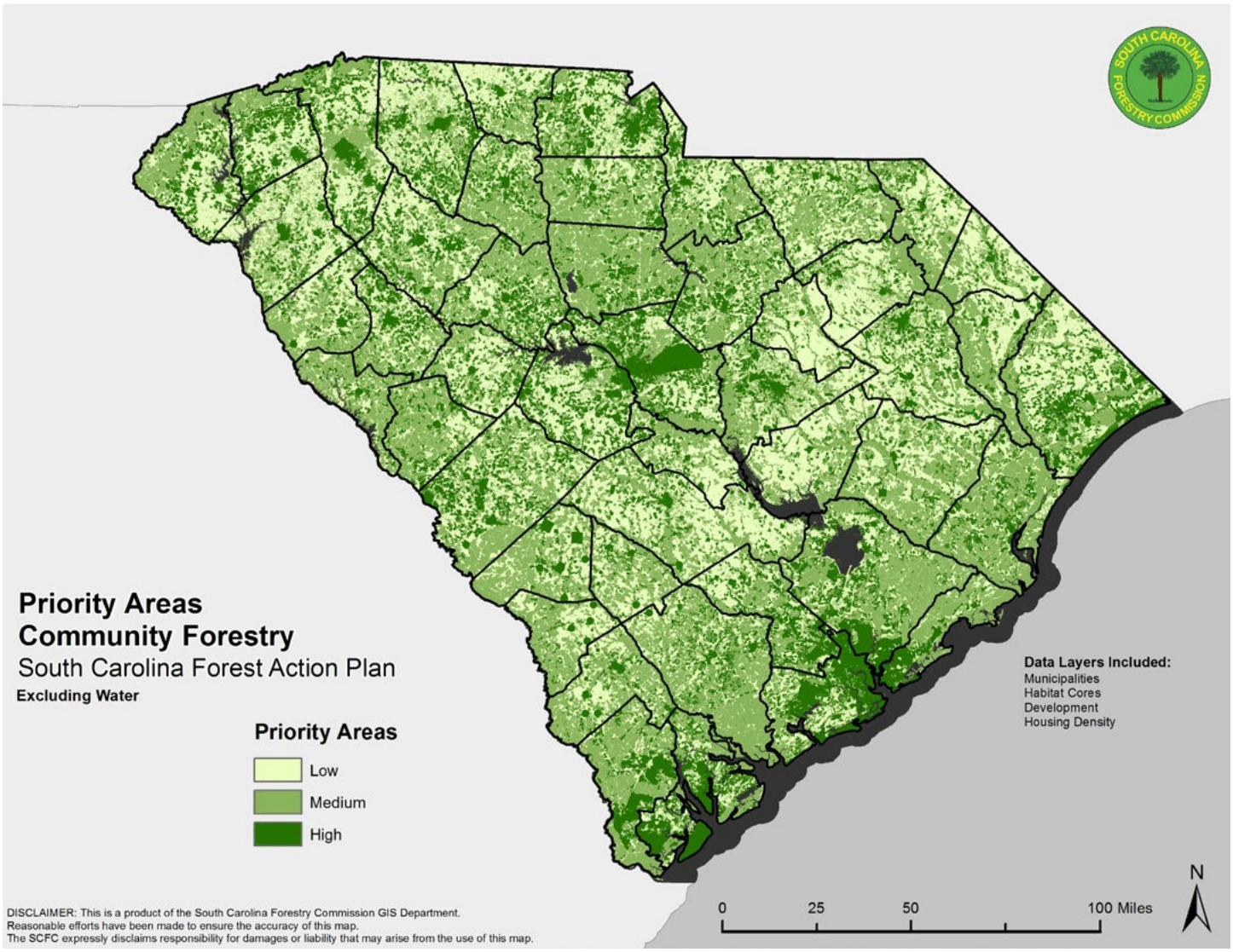
Table 4. Criteria, data layers, and relative weights used to create priority areas for the Community Forestry Working Group

GIS Layer	Source	Layer Weight
Municipalities	SCFC	50
Habitat Cores	SCFC/GIC	25
Development	SFLA	15
Housing Density	ICLUS	10

Results of the spatial analysis for the Community Forestry assessment yielded a single set of priority areas displayed in 30-meter pixel format (see below).

Description of Data Layers Used in Spatial Overlay Analyses

A total of 27 data layers were utilized in the spatial overlay analyses conducted for South Carolina's Statewide Forest Resource Assessment. Data layers utilized were derived from and/or provided by the SC Forestry Commission, Southern Group of State Forester's Southern Forest Land Assessment (SFLA), Southern Group of State Foresters' Southern Wildfire Risk Assessment (SWRA), USDA Natural Resources Conservation Service (NRCS), USDA Animal and Plant Health Inspection Service (APHIS), Clemson Department of Plant Industry, EPA Integrated Climate and Land-Use (ICLUS), Green Infrastructure Center, Inc. (GIC), US Forest Service Forest Health Assessment and Applied Sciences Team (FHAAST), USDA National Agricultural Statistics Service (NASS) CropScape, and the US Geological Survey (USGS).



Forestland

The forestland layer was originally developed for use in the SFLA using the USGS Cropland Data Layer (CDL). The 2019 CDL Forestland layer was included in the priority analysis to place emphasis on lands with existing forest cover. Two variations of the Forestland layer were utilized in the priority analyses. The layer was used in its original form in the Enhancing Public Benefits from Trees and Forests priority analysis. The Conserving Working Forests working group desired to place less emphasis on publically owned forestlands; therefore, a variant of the dataset was created that decreases the value of forest cover within federal ownerships in South Carolina.

Figure 2. Forestland data layer used in the Enhancing Public Benefits from Trees and Forests analysis

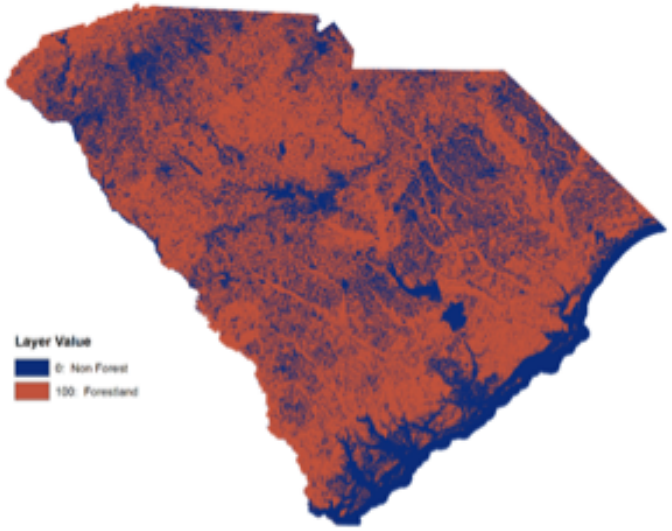
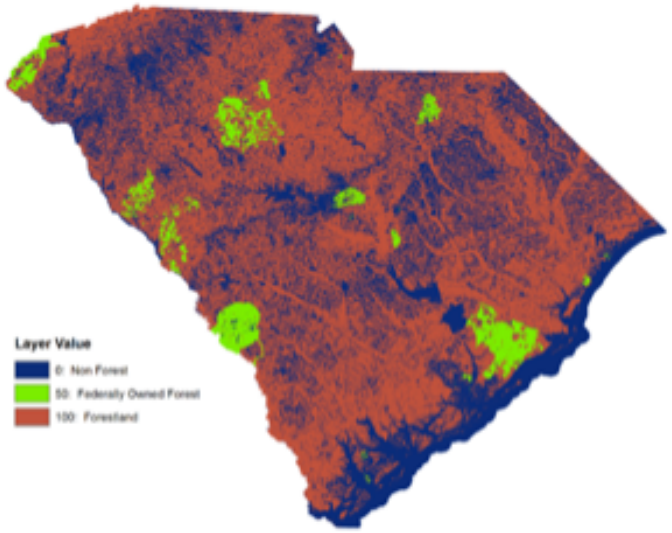


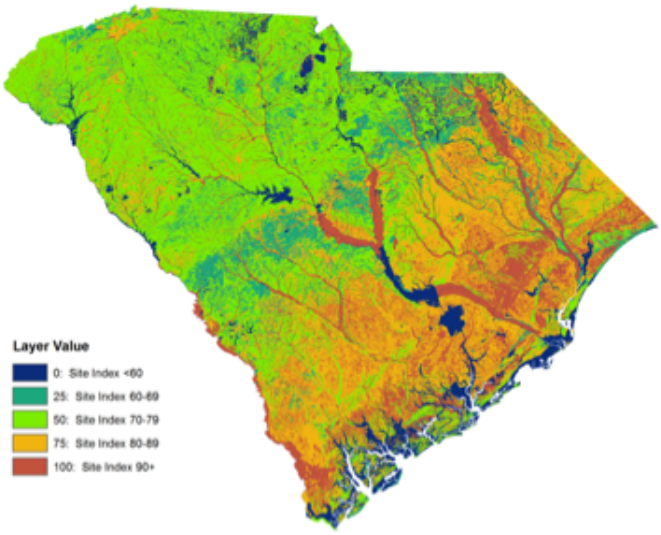
Figure 3. Forestland data layer used in the Conserving Working Forests analysis



Site Productivity

The Site Productivity Layer was originally developed for use in the SFLA using the 2018 NRCS Soil Survey Geographic Database (SSURGO). Site Productivity prioritizes areas with higher potential productivity in timber production using the site index (tree height at age 50) value. Areas with a greater site index height were assigned a higher layer value.

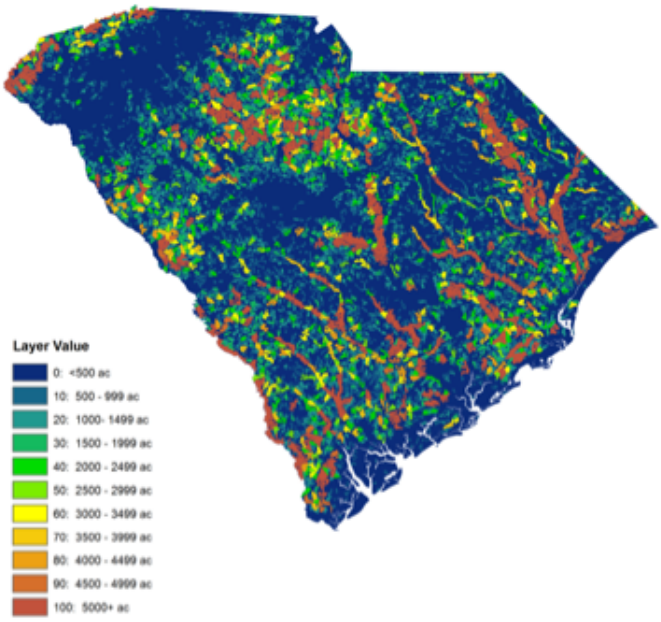
Figure 4. Site Productivity data layer used in the Conserving Working Forests analysis



Forest Patches

The Forest Patches layer was originally developed for use in the SFLA to represent the fragmentation of forests by various natural and manmade structures including roads,

Figure 5. Forest Patches data layer used in the Conserving Working Forests and Enhancing Public Benefits from Trees and Forests analyses

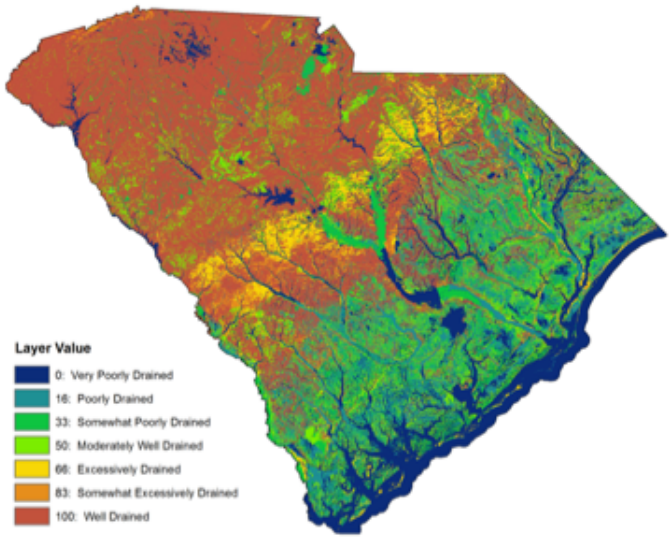


railroads, utility right-of-ways, rivers, etc. Forest Patches were created using the Forestland data layer described previously and separating it into smaller patches/fragments using a buffered OpenStreetMap roads and railroads layer. Layer values were assigned based on forest patch size (in acres) as seen below.

Soils Drainage

The Soils Drainage layer was created by the SC Forestry Commission GIS Department to prioritize areas that are sufficiently drained, operable, and potentially conducive for Longleaf Pine. The soils data was obtained from the Natural Resources Conservation Service (NRCS) gNATSGO database and layer values were assigned for each drainage classification.

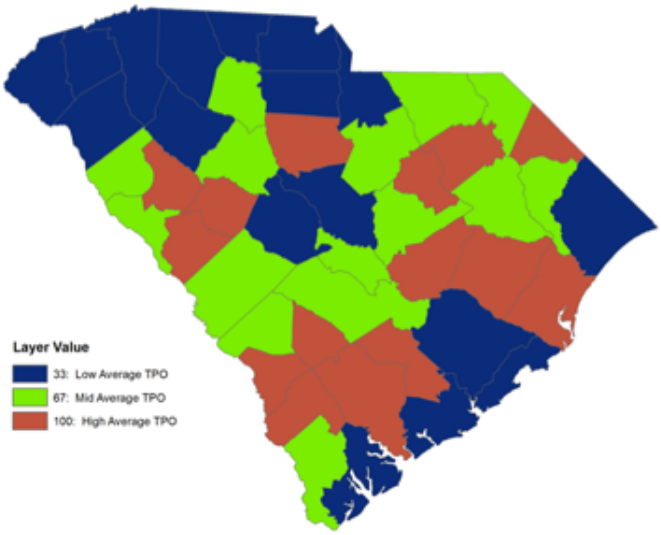
Figure 6. Soils Drainage data layer used in the Conserving Working Forests analysis



County Timber Product Output

To place emphasis on areas of South Carolina where there is high demand for forest products, the SC Forestry Commission GIS Department created a county level data layer representing South Carolina's Timber Product Output (TPO) removals. Average TPO removals per acre of timberland were calculated for each county using 2013, 2015, and 2017 TPO data. Layer values were assigned by dividing the counties into thirds (low, medium, and high) based upon their Average TPO removal per acre.

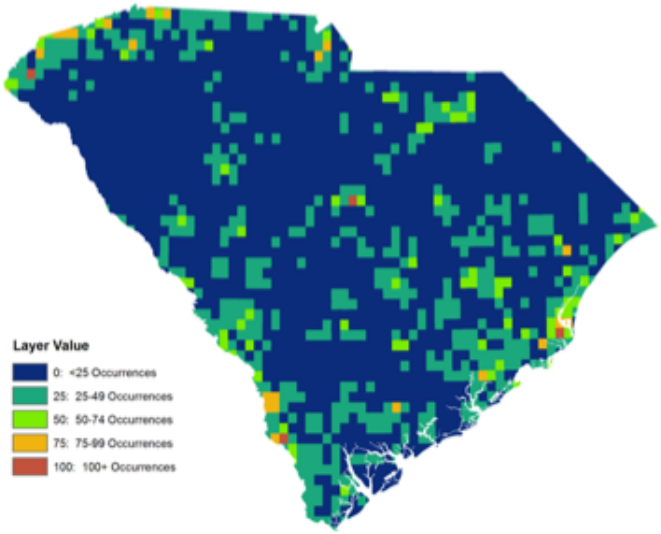
Figure 7. SC Timber Product Output data layer used in the Conserving Working Forests and Enhancing Public Benefits from Trees and Forests analyses



Threatened & Endangered Species

The Threatened and Endangered Species layer was originally developed for use in the SFLA by the North Carolina Forest Service (NCFS). NCFS worked with NatureServe to create a layer based on the Natural Heritage Element Occurrences database. The layer represents locations believed to be "potentially current and extant" and includes Element Occurrence Totals for G1/T1-G2/T2 and Federal ESA Status Species by Quarter Quadrangle for the Southeastern U.S. Layer values were assigned based on the number occurrences per quadrangle.

Figure 8. Threatened and Endangered Species data layer used in the Conserving Working Forests analysis



Development Level

The Development Level layer was originally created for use in the SFLA and was derived from the Integrated Climate and Land-Use (ICLUS) version 2 model. ICLUS version 2 is designed to be consistent with a more recent Intergovernmental Panel on Climate Change (IPCC) scenarios framework, drawing from two Shared Socioeconomic Pathways (SSPs) and two Representative Concentration Pathways (RCPs). ICLUS v2 uses a deterministic demand-allocation approach that assumes many aspects of future growth will resemble the recent past (i.e., 2000 to 2010), though over time, land use changes would result in different overall patterns. ICLUS v2 sequentially allocates patches from seven of the 19 discrete land use classes (LUC) used in ICLUS v2: five levels of residential, plus commercial and industrial and projects change to these seven "developed" land use types. The land use categories are based on Theobald's National Land Use dataset. Transitions from rural to the five levels of residential and the less dense residential categories to more dense residential categories are then used to define the layer value scheme shown in Table 5 below.

Figure 9. Development Level data layer used in the Conserving Working Forests, Enhancing Public Benefits from Trees and Forests, and Community Forestry analyses.

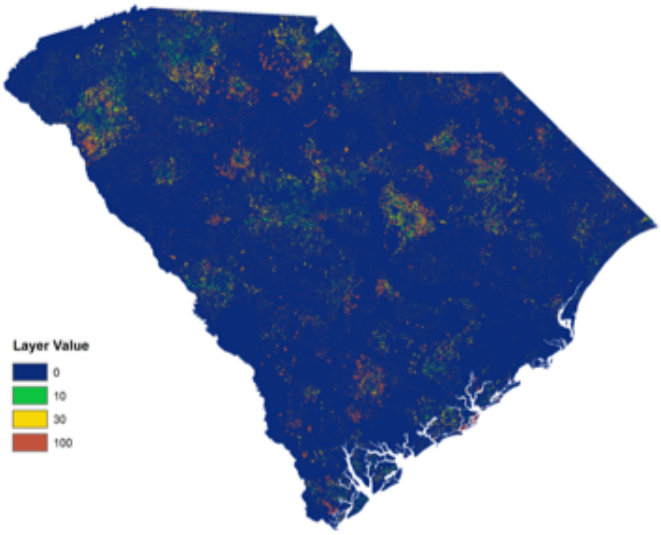


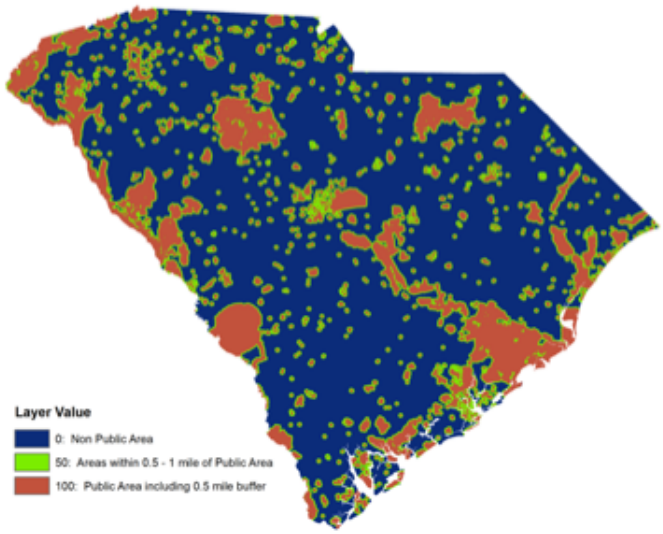
Table 5. Housing density classes and layer value scheme for Development Level

	Landuse	2040	Exurban, low density	Exurban, high density	Suburban	Urban, low density	Urban, high density
Class			exurban	exurban	suburban	urban	urban
Code			**10**	**11**	**12**	**13**	**14**
Landuse 2010	**Class**	**Code**					
Wetlands	rural	**2**	100	100	100	100	100
Timber	rural	**4**	100	100	100	100	100
Grazing	rural	**5**	100	100	100	100	100
Pasture	rural	**6**	100	100	100	100	100
Cropland	rural	**7**	100	100	100	100	100
Exurban, low density	exurban	**10**	0	30	30	30	30
Exurban, high density	exurban	**11**		0	10	10	10
Suburban	suburban	**12**			0	0	0
Urban, low density	urban	**13**				0	0
Urban, high density	urban	**14**					0

Proximity to Public Land

The Proximity to Public Land layer was originally created for use in the SFLA using the Protected Areas Database of the United States (PAD-US) version 1.4. This layer prioritizes public lands that are considered to be permanently protected in status. Each protected area was buffered by 0.5 and 1.0 mile and assigned a layer value as shown in Figure 10.

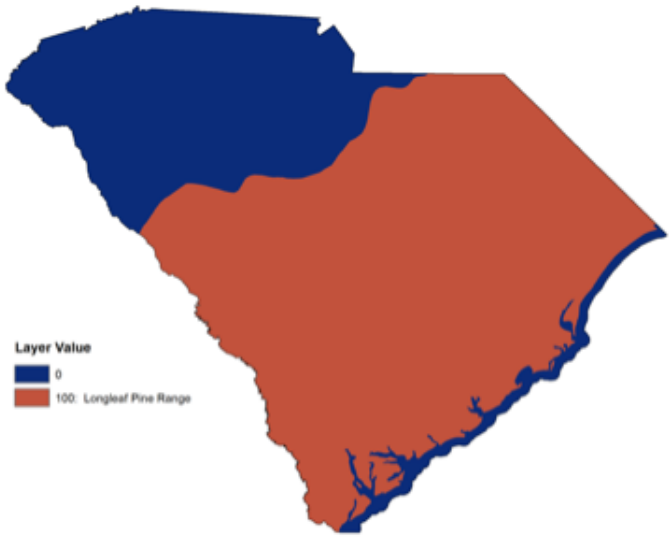
Figure 10. Proximity to Public Land data layer used in the Conserving Working Forests analysis



Longleaf Pine Range

The Longleaf Pine Range layer was created by the SC Forestry Commission GIS Department to prioritize areas falling within the USDA Natural Resources Conservation Service (NRCS) designated range for the Longleaf Pine. Areas within the Longleaf Pine range were assigned a layer value of 100 as seen is Figure 11 below.

Figure 11. Longleaf Pine Range data layer used in the Conserving Working Forests analysis



Wildfire Occurrence 2010 - 2020

The Wildfire Occurrence layer was created by the SC Forestry Commission GIS Department to place emphasis on areas with a history of wildfire occurrence. Wildfire data gathered and stored in the SC Forestry Commission's dispatch operations database was used to create a Hot Spot raster prioritizing areas with a higher density of wildfire occurrences. Layer values were assigned to areas based upon their relative fire density as seen in Figure 12 below.

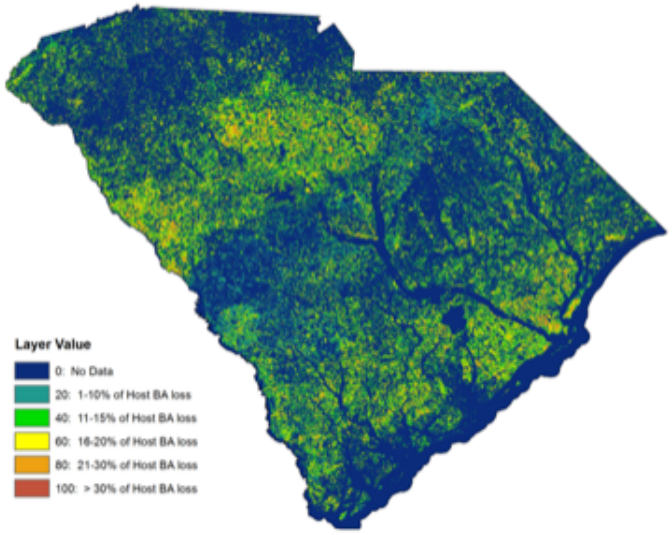
Wildland Urban Interface Risk

The Wildland Urban Interface (WUI) Risk layer was created by the SC Forestry Commission GIS Department to represent the potential impact of a wildfire on people and their homes. The data was obtained from the Southern Group of State Foresters Wildfire Risk Assessment Portal (SGSF WRAP) WUI Risk Index theme. The WUI Risk Index was calculated by combining WUI housing density data with Flame Length data to determine where the greatest potential impact to homes and people is likely to occur. The WUI Risk Index range of values (9 total – ranging from minor to major impact) were reclassified into the layer values seen in Figure 13 below.

Southern Pine Beetle Hazard

The Southern Pine Beetle Hazard layer was created by the SC Forestry Commission GIS Department to prioritize areas with the potential for significant Southern Pine Beetle (SPB) activity. The SPB data was obtained from the US Forest Service's National Insect and Disease Risk Map and displays the potential hazard for tree mortality due to SPB during the 2013-2027 time frame. The SPB Hazard range of values (5 total – based upon the estimated percentage of Basal Area lost) were reclassified into the layer values seen in Figure 14 below.

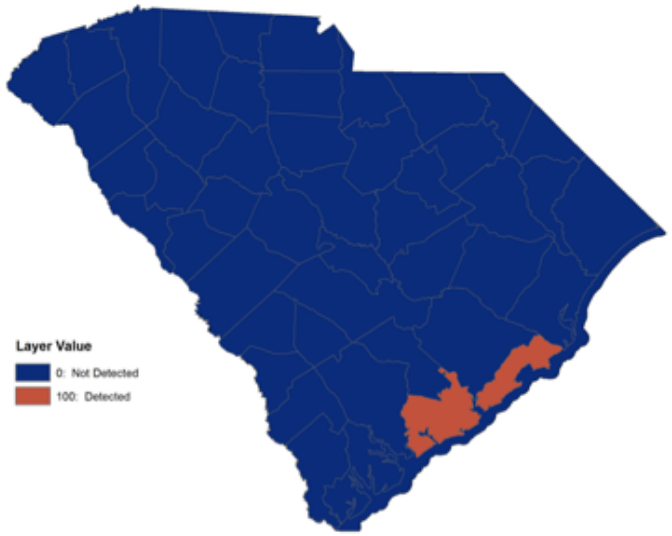
Figure 14. Southern Pine Beetle Hazard data layer used in the Protecting Forests from Harm analysis



Asian Longhorned Beetle Detection

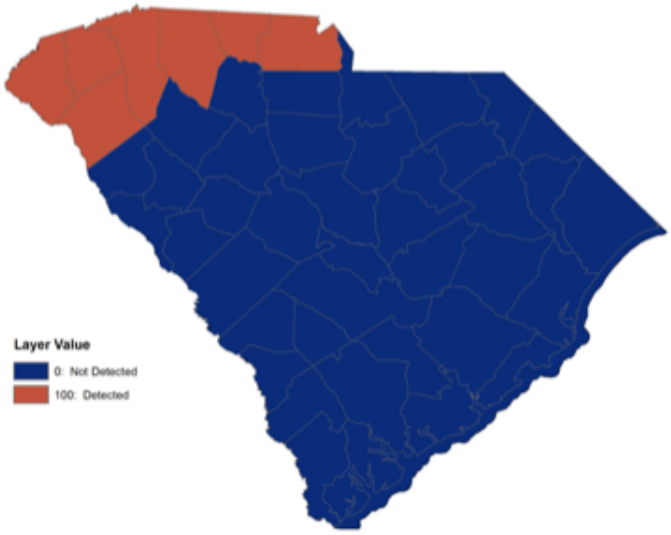
The Asian Longhorned Beetle (ALB) Detection layer was created by the SC Forestry Commission GIS Department to emphasize the ALB as a major threat to forest health in South Carolina. The county-level data was obtained from the USDA APHIS (Animal and Plant Health Inspection Service) and the Clemson Department of Plant Industry. Counties detected as having ALB present were assigned a layer value of 100 as seen in Figure 15.

Figure 15. Asian Longhorned Beetle Detection data layer used in the Protecting Forests from Harm analysis



Emerald Ash Borer Detection

Figure 16. Emerald Ash Borer Detection data layer used in the Protecting Forests from Harm analysis

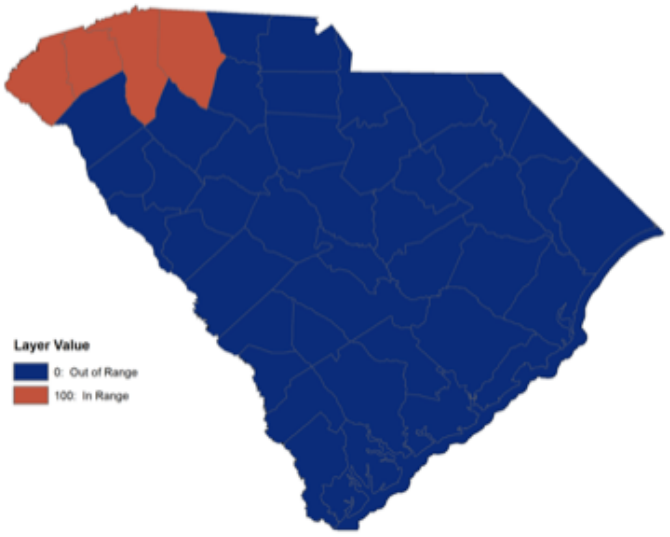


The Emerald Ash Borer (EAB) Detection layer was created by the SC Forestry Commission GIS Department to emphasize the EAB as a major threat to forest health in South Carolina. The county-level data was obtained from the USDA APHIS (Animal and Plant Health Inspection Service) and the Clemson Department of Plant Industry. Counties detected as having EAB present were assigned a layer value of 100 as seen in Figure 16.

Hemlock Woolly Adelgid Range

The Hemlock Woolly Adelgid (HWA) Range layer was created by the SC Forestry Commission GIS Department to emphasize areas where HWA could be present in South Carolina. The county-level data was obtained from the US Forest Service and displays the range of Hemlock trees in SC. Counties detected as having the potential for HWA were assigned a layer value of 100 as seen in Figure 17.

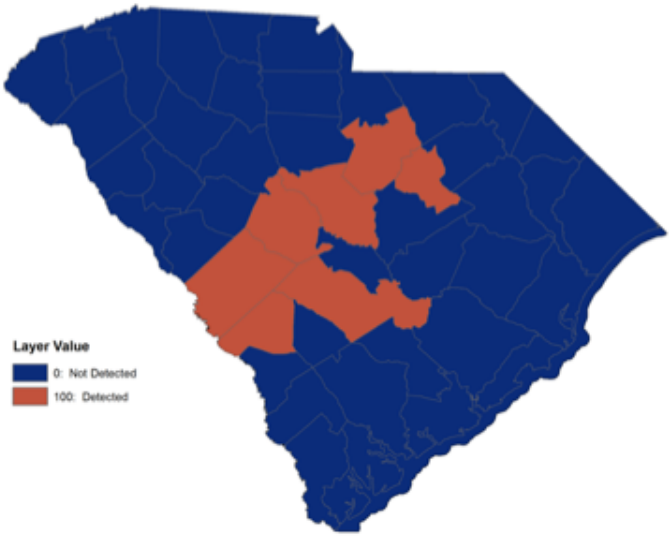
Figure 17. Hemlock Woolly Adelgid Range data layer used in the Protecting Forests from Harm analysis



Oak Wilt Disease Detection

The Oak Wilt Disease Detection layer was created by the SC Forestry Commission GIS Department to emphasize Oak Wilt as a major threat to forest health in South Carolina. The county-level data was supplied by the SC Forestry Commission. Counties detected as having Oak Wilt present were assigned a layer value of 100 as seen in Figure 18.

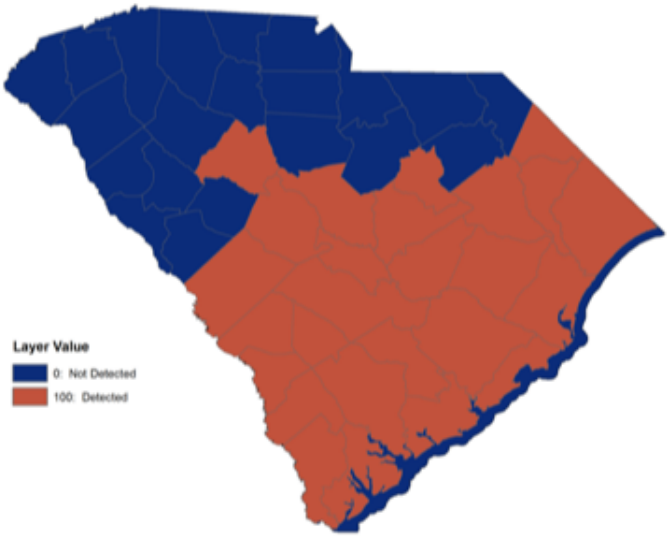
Figure 18. Oak Wilt Disease Detection data layer used in the Protecting Forests from Harm analysis



Laurel Wilt Disease Detection

The Laurel Wilt Disease Detection layer was created by the SC Forestry Commission GIS Department to emphasize Laurel Wilt as a major threat to forest health in South Carolina. The county-level data was supplied by the SC Forestry Commission. Counties detected as having Laurel Wilt present were assigned a layer value of 100 as seen in Figure 19.

Figure 19. Laurel Wilt Disease Detection data layer used in the Protecting Forests from Harm analysis



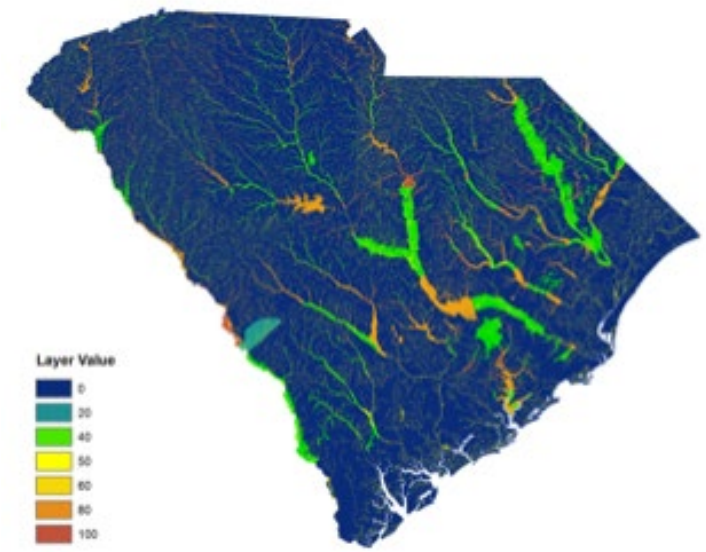
Riparian Areas

The Riparian Areas layer was originally created for use in the SFLA to emphasize lands that occur along watercourses and water bodies. The layer was created using National Hydrography Dataset (NHD) NHDPlus and FEMA Floodplain data. NHD flowline data was buffered according to stream order (order 1 - 4 by 50 meters and order > 4 by 100 meters) and then combined with the FEMA floodplains by mosaicking both into a new raster. The resulting raster was then assigned layer values as found in Table 6.

Table 6. Layer value scheme for Riparian Areas

Value	Description
0	Not Riparian
20	From Floodplain, flood zones identified by the letters A or V represent high-risk areas, known as Special Flood Hazard Areas (SFHAs). On some flood maps, there may also be a zone labeled with the letter D. The Zone D designation is used for areas where there are possible but undetermined flood hazards, as no analysis of flood hazards has been conducted. The designation of Zone D is also used when a community incorporates portions of another community's area where no map has been prepared.
40	From Floodplain, Zone A identifies an approximately studied special flood hazard area for which no Base Flood Elevations (BFEs) have been provided.
50	NHD Flowline buffered by 50 or 100 meters.
60	From Floodplain, Zone AO is the flood insurance rate zone that corresponds to the areas of 1-percent shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet.
80	From Floodplain, Zone AE areas subject to inundation by the 1-percent annual chance flood event determined by detailed methods.
100	From Floodplain, a "Regulatory Floodway" which means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood.

Figure 20. Riparian Areas data layer used in the Enhancing Public Benefits from Trees and Forests analysis



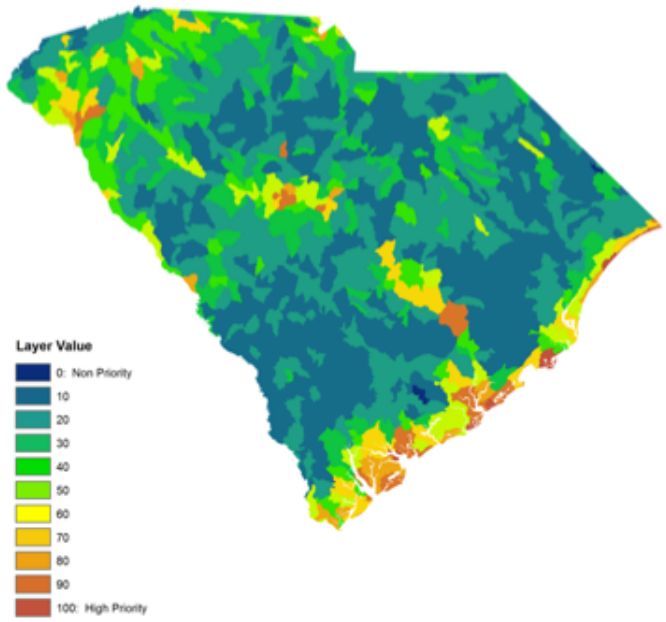
Priority Watersheds

The Priority Watersheds layer was originally created for use in the SFLA to prioritize areas that impact long term watershed function. The national Spatial Analysis Project (SAP) intent statement for this layer suggests priority watersheds can be those that are impaired or deforested, but could be measurably improved through planning and active management, or those that are currently productive, but somehow threatened. 12-digit watershed boundaries were downloaded from the USGS Watershed Boundary Dataset (WBD) and used in conjunction with the Forestland and Riparian Area layers to create a forested area per watershed raster and a forested riparian area per watershed raster. These two rasters were then combined to create the Priority Watersheds layer and layer values were assigned as seen in Table 7.

Table 7. Layer value scheme for Priority Watersheds

Percent of Watershed forested	Percent of Riparian Area forested within Watershed										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0%	100	100	90	80	70	60	50	40	30	20	10
10%	100	100	90	80	70	60	50	40	30	20	10
20%	90	90	90	80	70	60	50	40	30	20	10
30%	80	80	80	80	70	60	50	40	30	20	10
40%	70	70	70	70	70	60	50	40	30	20	10
50%	60	60	60	60	60	60	50	40	30	20	10
60%	50	50	50	50	50	50	50	40	30	20	0
70%	40	40	40	40	40	40	40	40	30	20	0
80%	30	30	30	30	30	30	30	30	30	20	0
90%	20	20	20	20	20	20	20	20	20	20	0
100%	10	10	10	10	10	10	0	0	0	0	0

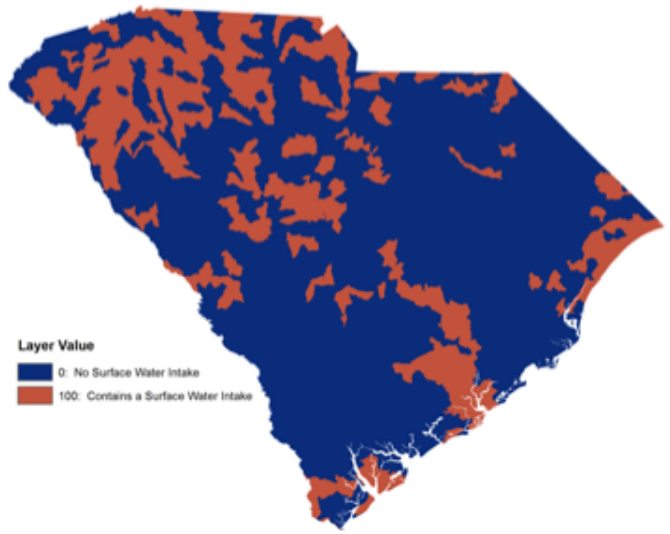
Figure 21. Priority Watersheds data layer used in the Enhancing Public Benefits from Trees and Forests analysis



Public Drinking Water

The Riparian Areas layer was originally created for use in the SFLA and prioritizes areas that drain into intake points for the public drinking water supply. 12-digit watershed boundaries were downloaded from the USGS Watershed Boundary Dataset (WBD) and intersected with the EPA Safe Drinking Water Information System surface water intake locations. Watershed boundaries that contained a surface water intake for public drinking water were assigned a layer value of 100 as seen in Figure 22.

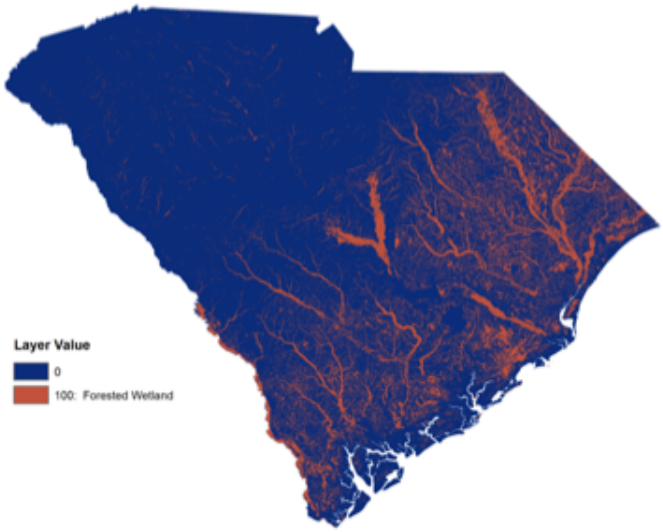
Figure 22. Public Drinking Water data layer used in the Enhancing Public Benefits from Trees and Forests analysis



Forested Wetlands

The Forested Wetlands layer was originally created for use in the SFLA and emphasizes the forested wetlands in South Carolina and the importance of protecting these wetland areas. The layer was extracted from the 2016 National Wetlands Inventory (NWI) dataset created by the U.S. Fish and Wildlife Service. Areas designated strictly as Forested Wetlands were assigned a layer value of 100 as seen in Figure 23 below.

Figure 23. Forested Wetlands data layer used in the Enhancing Public Benefits from Trees and Forests analysis



Slope

The Forested Wetlands layer was originally created for use in the SFLA and prioritizes areas with a slope ranging between 10 and 50%. The data was derived from the USGS National Elevation Dataset (NED) Digital Elevation Model using the ArcGIS Spatial Analyst extension. Slopes between 10 and 50% were assigned a layer value of 100 and all other slope percentages were assigned a layer value of 0.

Figure 24. Slope data layer used in the Enhancing Public Benefits from Trees and Forests analysis

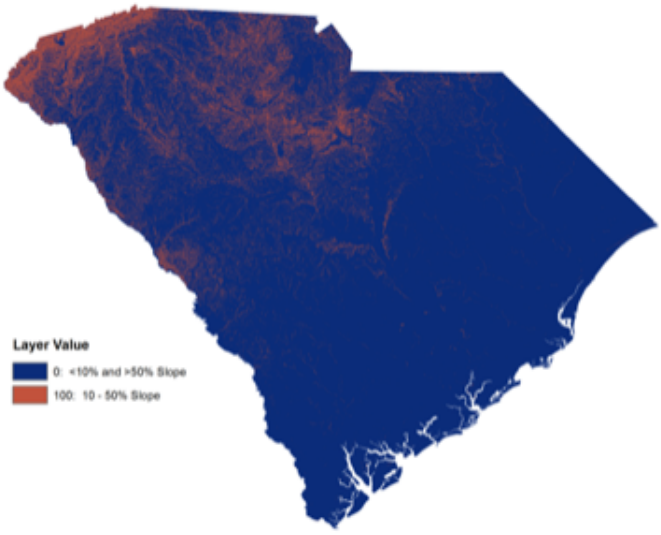
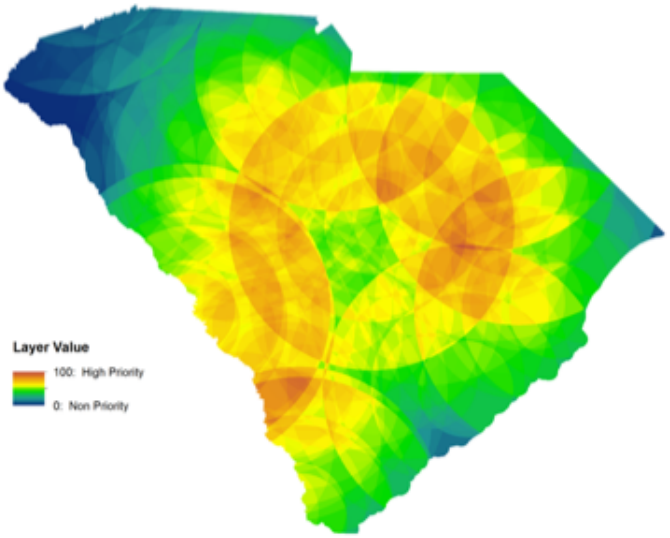


Figure 25. Proximity to Mills data layer used in the Enhancing Public Benefits from Trees and Forests analysis



Proximity to Mills

The Proximity to Mills layer was created by the SC Forestry Commission GIS Department to emphasize areas of South Carolina where multiple timber markets exist and overlap. Buffers rings were created and weighted for SC mill locations based on their overall production. Larger mills are presumed to have a larger service area and customer base. Small production mills received one 0-20 mile buffer ring; Medium production mills received two buffer rings - one 0-20 mile ring and one 20-40 mile ring; and Large/ Pulp mills received three buffer rings - one 0-20 mile ring, one 20-40 mile ring, and one 40-60 mile ring. Weights were assigned to each buffer ring based upon its associated mill size as seen below in Table 8. The Intersect tool was then utilized to find all instances of overlap between the buffer rings for each mill size. Overlapping areas with identical geometries were aggregated (Dissolve tool) with the sum of the weighted values included as a statistic field. The aggregated polygon feature classes were then converted to a raster using the sum field as the raster value. The small, medium, large, and pulp mill rasters were then combined using the Raster Calculator and normalized by scaling the raster layer values down to a 0-100 scoring range.

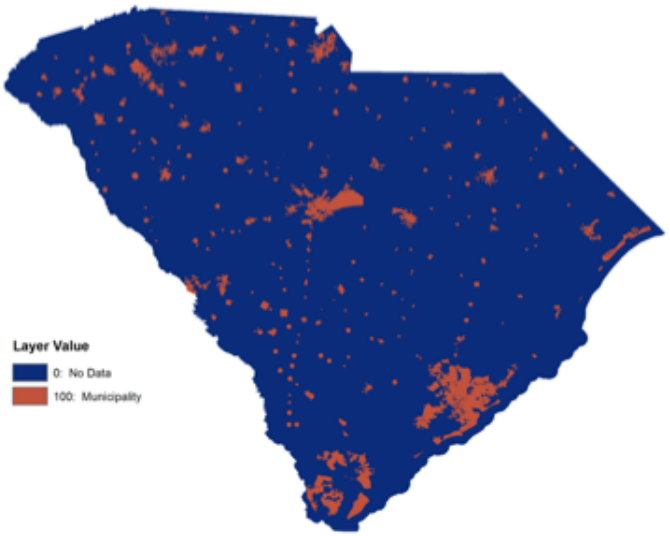
Table 8. Proximity to Mills Buffer Ring Weights

Timber Mill Size	Buffer Ring assigned Weighting		
	0-20 miles	20-40 miles	40-60 miles
Small	100	100	90
Medium	100	100	90
Large	90	90	90
Pulp	80	80	80

Municipalities

The Municipalities layer was created by the SC Forestry Commission GIS Department to place emphasis on urban forest management in cities and towns throughout South Carolina. Current city/town boundaries were converted to a raster and assigned a layer value of 100 as seen in Figure 26.

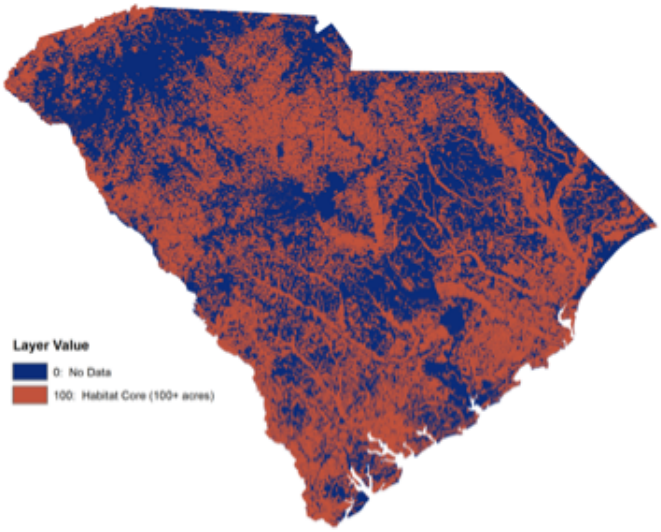
Figure 26. Municipalities data layer used in the Community Forestry analysis



Habitat Cores

The Habitat Cores layer was used by the SC Forestry Commission GIS Department to emphasize minimally disturbed natural areas for the Community Forestry analysis. These intact Habitat Cores were created using methodology outlined by the Green Infrastructure Center (GIC) and include minimally disturbed natural areas 100 acres or greater in size and at least 200 meters wide. Areas considered to be habitat cores received a layer value of 100.

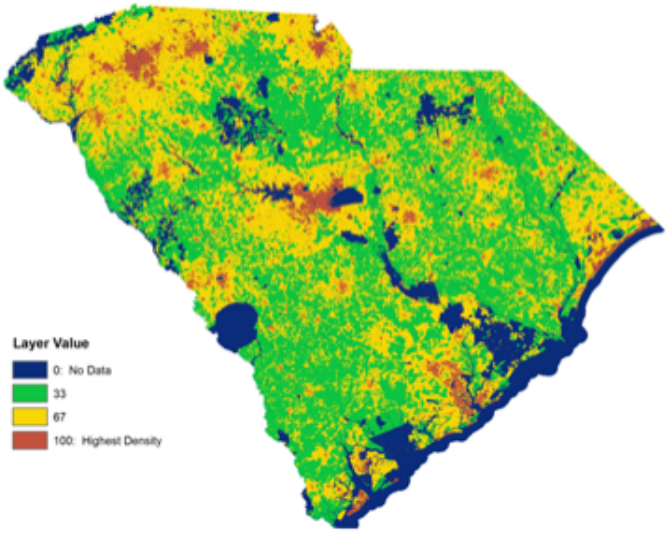
Figure 27: Habitat Cores data layer used in the Community Forestry analysis



Housing Density

The Housing Density layer was created by the SC Forestry Commission GIS Department to prioritize projected future population increases in South Carolina. 2040 Housing Density projection data was downloaded from the Integrated Climate and Land-Use (ICLUS) version 1.32 model. The B2 SRES (Special Report on Emissions Scenarios) Storyline results were chosen for this analysis due to its moderate/average depictions of fertility, mortality, and migration for both industrialized and developing areas. For simplicity, housing density projections were reclassified into low (layer value 33), medium (layer value 67), and high (layer value 100) as seen in Figure 28.

Figure 28: Housing Density data layer used in the Community Forestry analysis



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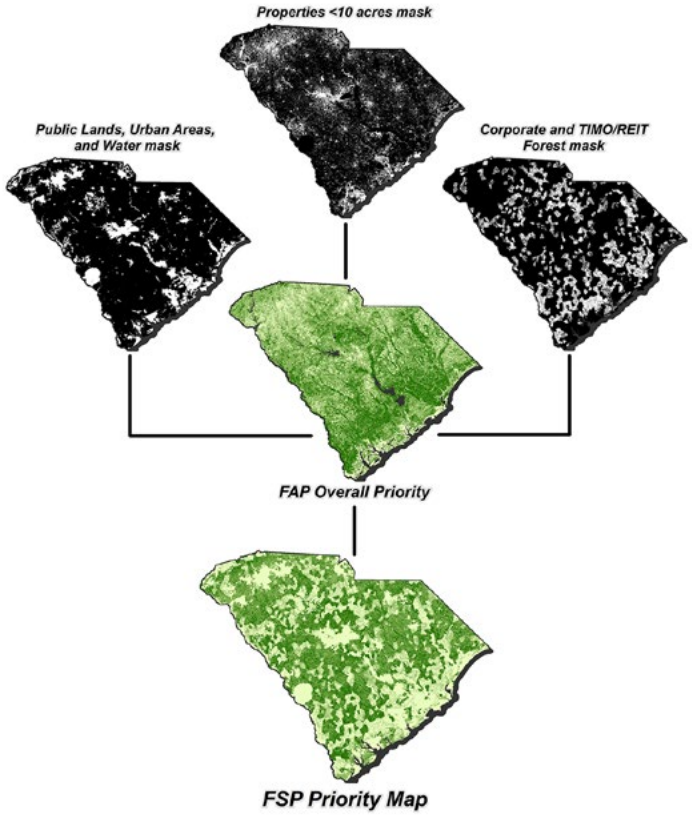
Vose, C.; D. O'Loughlin; and D. Jones. 2018. Forest Action Plan Layers Update: A Cooperative Project of the Southern Group of State Foresters. Geospatial Services Branch, North Carolina Forest Service.

APPENDIX 2
DEVELOPMENT OF PRIORITY AREAS FOR SOUTH CAROLINA'S FOREST STEWARDSHIP PROGRAM

Figure 1. Hierarchy of spatial analyses for South Carolina's Statewide Forest Stewardship Program (FSP) Assessment



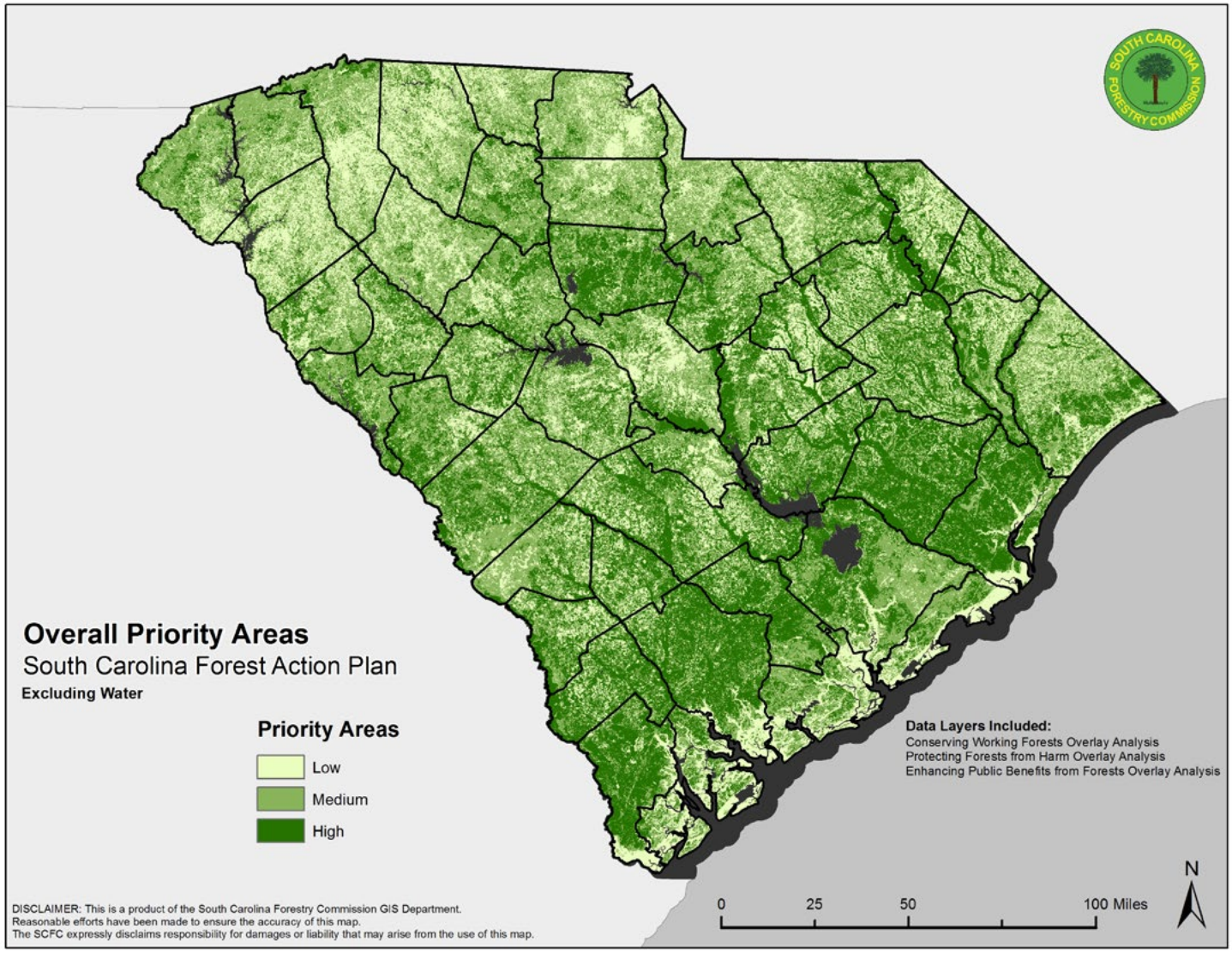
Priority areas were developed for the Forest Stewardship Program (FSP) using the ESRI Geographic Information System (GIS) software Spatial Analysis toolset. Using the Overall Priority Area raster from the Forest Action Plan (FAP) analyses, the Extract by Mask tool was primarily utilized with the following methodology:

1. Due to US Forest Service restrictions for the Forest Stewardship Program, the FAP Overall Priority Area raster was masked to exclude the following land types:
   - Public lands, urban areas, and water bodies.
   - Properties smaller than 10 acres in size.
   - Corporate and TIMO/REIT owned forests.

   These masked land types were all classified as Non Stewardship Potential in the FSP Priority Area raster.

2. The remaining non-masked areas from the FAP Overall Priority raster were then classified into either Stewardship Potential or High Stewardship Potential areas. Due to Forest Service limitations on the amount of eligible stewardship acreage, raster value classifications were adjusted to maximize South Carolina's High Stewardship Potential areas. Pixels with higher value scores from the FAP analyses were incrementally classified as High Stewardship Potential until the maximum amount of eligible acres for SC was reached. The remaining lower scored pixels were subsequently classified as Stewardship Potential.

APPENDIX 3
PRIORITY AREA MAPS



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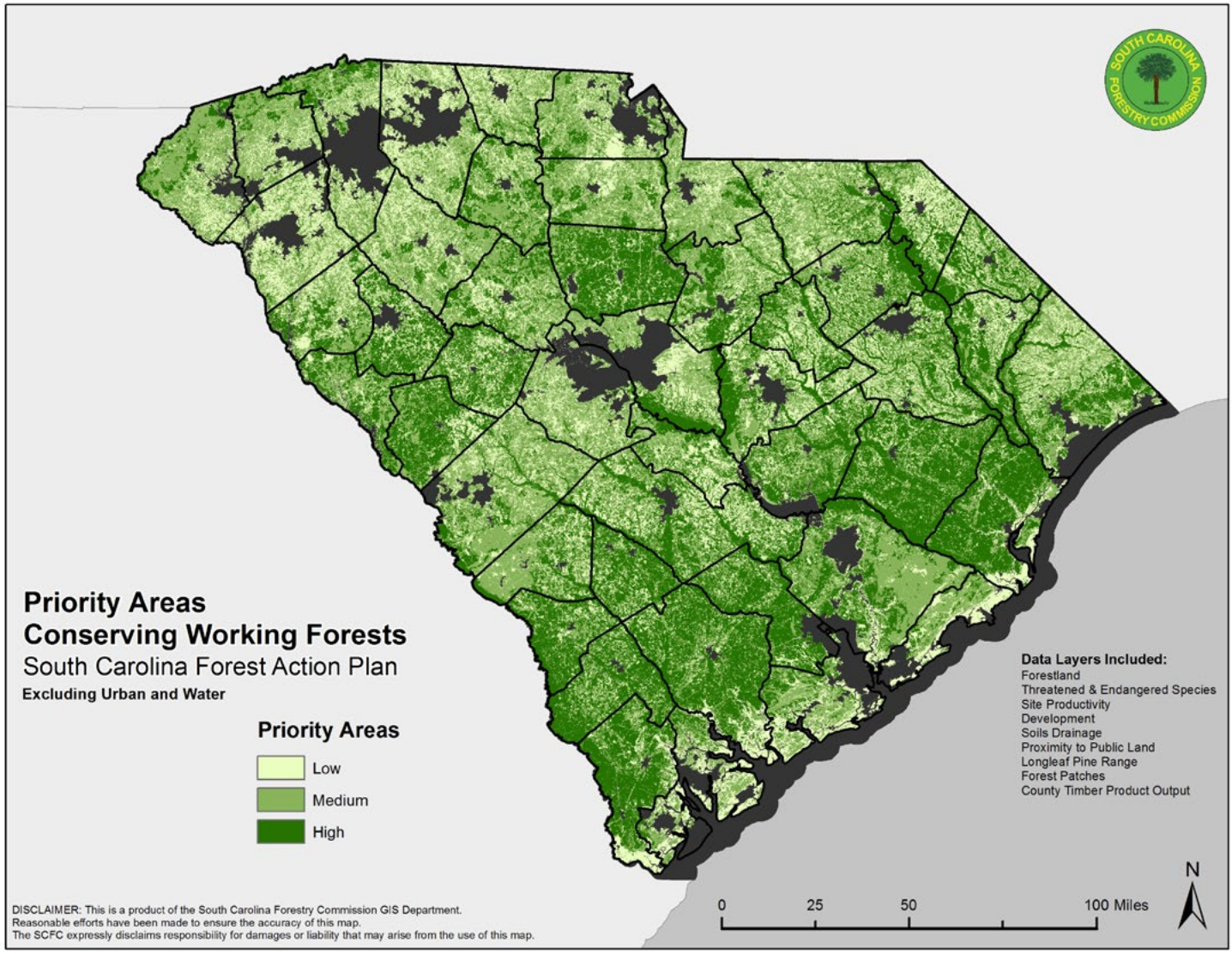

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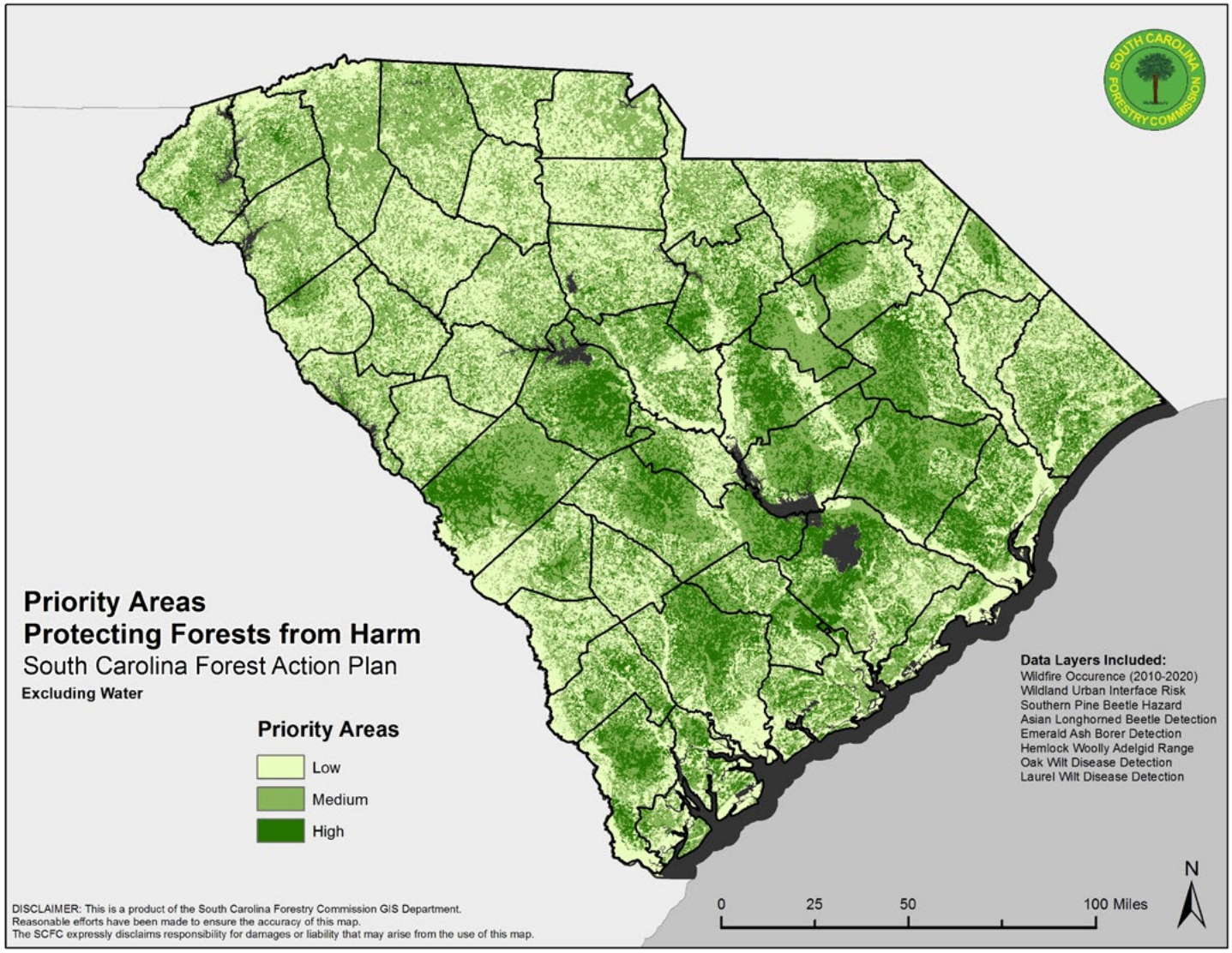

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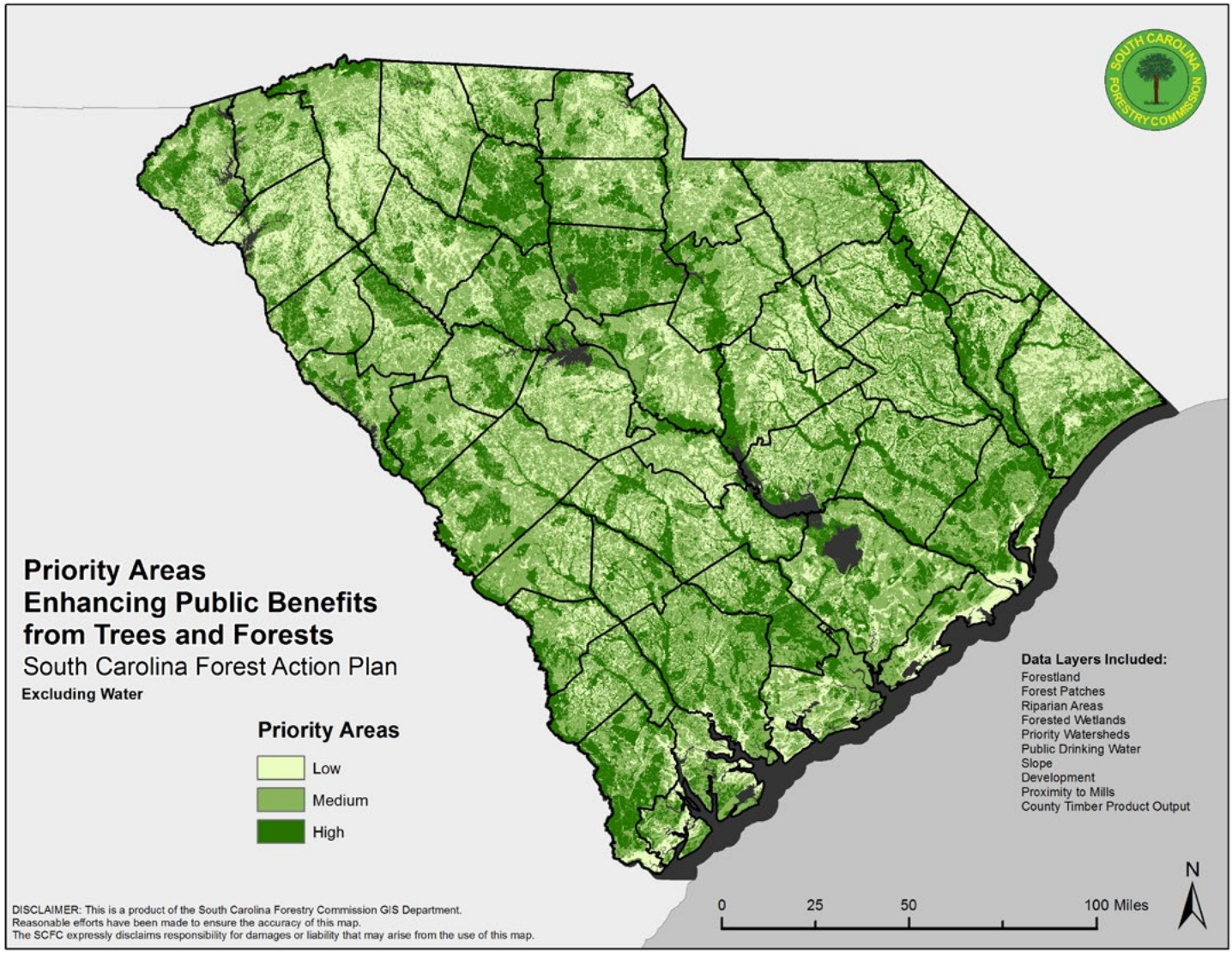

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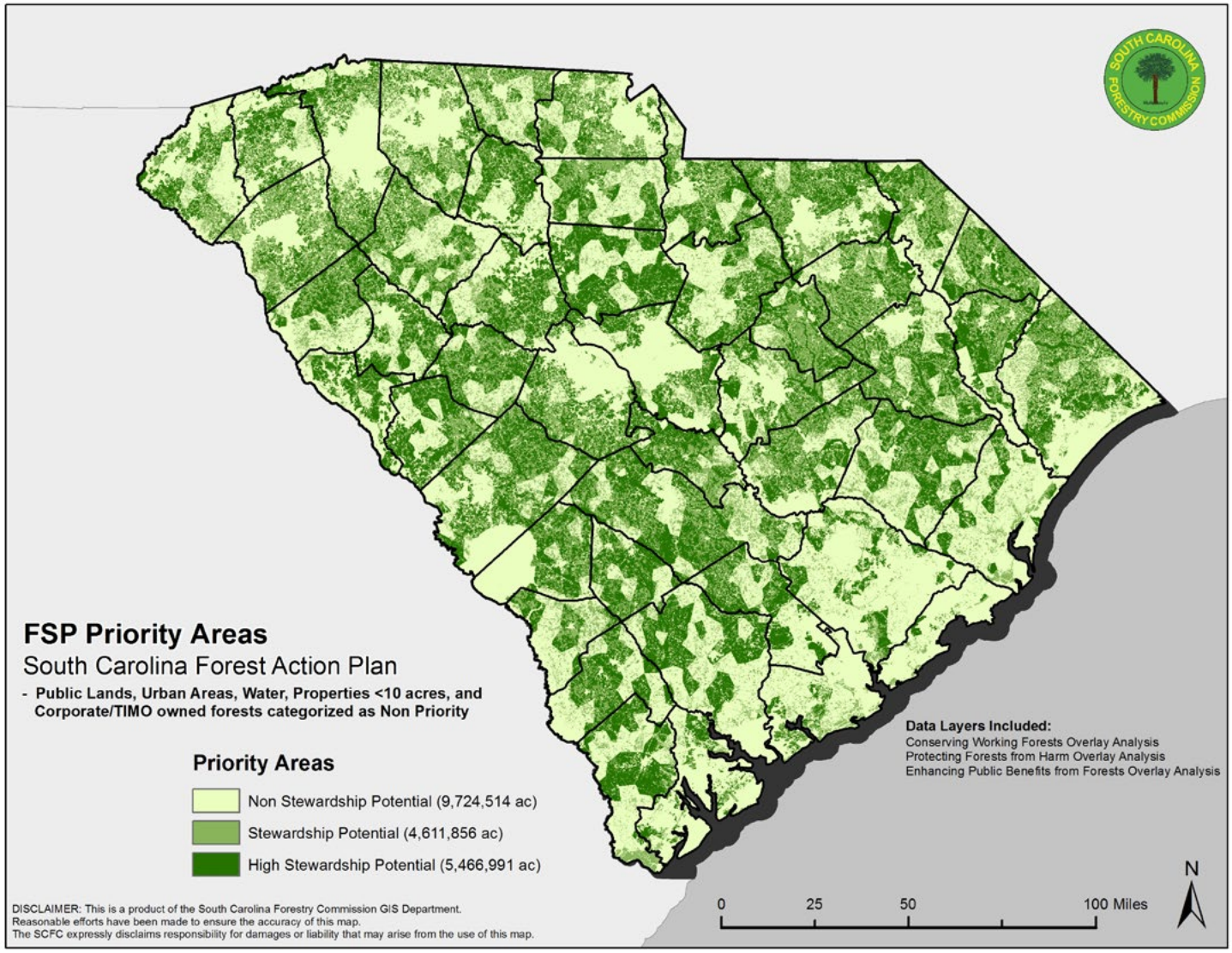

APPENDIX 4
MULTI-STATE ISSUES

Issue Revised July 2020	States Included (current and/or potential)
Identify and conserve high priority forest ecosystems and landscapes Example of current activity: restoration of longleaf pine ecosystem	VA, NC, SC, GA, FL, AL, MS, LA, TX
Regional forest health issues Example of current activity: cogongrass eradication, Chinese tallow tree, Callery pear	SC, GA, FL, AL, MS, LA, TX, TN
Conserve working forests Example of current activity: ensure that local ordinances do not restrict forest management activities	VA, NC, SC, GA, FL, AL, MS, LA, TX, TN, OK, AR, KY
Regional wildfire issues Example of current activity: One Message, Many Voices campaign	VA, NC, SC, GA, FL, AL, MS, LA, TX, TN, OK, AR, KY
Water quality and quantity Example of current activity: conflict over water use	GA (Atlanta's water use), SC, NC (Charlotte water use)
Wildland-urban interface issues Example of current activity: Changing Roles training	VA, NC, SC, GA, FL, AL, MS, LA, TX, TN, OK, AR, KY
Economic vitality of forestry Example of current activity: online mapping of forest products facilities	NC, SC, GA

APPENDIX 5
STAKEHOLDERS

American Rivers
Army Corps of Engineers
Association of Consulting Foresters
Audubon South Carolina
Beaufort County Open Land Trust
Catawba Indian Nation
Center for Heirs' Property Preservation
Central Midlands Council of Government
Clemson Extension Service
Clemson University
Coastal Conservation League
Congaree Land Trust
Conservation Voters of SC
Dominion Energy
Ducks Unlimited
Forestry Association of South Carolina
Green Infrastructure Center
Longleaf Alliance
Municipal Association of South Carolina
National Park Service
National Wild Turkey Federation
Naturaland Trust
Palmetto Agribusiness Council
Pee Dee Land Trust
SC Department of Natural Resources
SC Association of Conservation Districts
SC Association of Counties
SC Chamber of Commerce
SC Chapter of American Waterworks Association
SC Chapter of the American Planning Association
SC Conservation Bank
SC Department of Agriculture
SC Dept. of Health & Environmental Control
SC Department of Natural Resources
SC Farm Bureau
SC Native Plant Society
SC Nursery & Landscape Association
SC Prescribed Fire Council
SC Rural Water Authority
SC State Firefighters' Association
SC State Park Service
SC Timber Producers Association
SC Tree Farm Committee
SC Wildlife Federation
SCFC Board of Commissioners
SFI Committee
Sierra Club
Stewardship Coordinating Committee
The Conservation Fund
The Nature Conservancy
Tree Farm - SC Committee
Trees SC
University of South Carolina
Upstate Forever - Water
US Air Force - Joint Base Charleston
US Army - Ft. Jackson
US Endowment for Forestry & Communities, Inc.
US Fish & Wildlife Service
USDA Farm Service Agency
USDA Forest Service
USDA Natural Resources Conservation Service
WestRock

APPENDIX 6
FOREST LEGACY ASSESSMENT OF NEED

Editor's Note: This document is under revision and will be replaced with an updated version when available.

Statement of Purpose

South Carolina entered the Forest Legacy Program in 1999. Since then, the South Carolina Department of Natural Resources (SCDNR) has received almost $32 million that worked to conserve over 71,000 acres in South Carolina (Appendix A). The Forest Legacy Program is critical to the conservation of habitats in South Carolina and to the SCDNR's ability to leverage other funds for habitat conservation. The purposes of this update are to revise the target areas for the Forest Legacy Program in South Carolina, provide updated threat information, and provide updated operating procedures.

South Carolina is approximately 20 million acres in size with 19.2 and 1.3 million acres in land area and water area, respectively. In 2008 it was estimated that 12.9 million acres of land in South Carolina were forested. With an ever increasing statewide population, South Carolina is seeing a tremendous rise in residential and commercial development, and many of South Carolina's forest lands are being converted to non-forest uses.

In March 1999 the governor of South Carolina appointed the South Carolina Department of Natural Resources (SCDNR) as the state lead agency to develop and administer a Forest Legacy Program in South Carolina. The purpose of the Forest Legacy Program (FLP) is to identify and protect environmentally important forest land from conversion to non-forest uses, through the use of conservation easements and fee purchases. Under the guidelines for the Forest Legacy Program, the SCDNR prepared an Assessment of Need (AON) to establish a state Forest Legacy Program. The SCDNR worked in consultation with the State Forest Stewardship Coordinating Committee (SFSCC) and the South Carolina Forestry Commission (SCFC) to develop the AON. Representatives from the SCDNR, SCFC, and SCFSCC were asked to serve on the Forest Legacy Subcommittee. The state grant option was selected in the AON. Under the State Grant Option, all FLP acquisitions shall be transacted by the state with the title vested in the state. Landowner participation is entirely voluntary.

The Forest Legacy Subcommittee identified five Forest Legacy Areas in need of conservation and long-term forest management. At the request of the Forest Service, the Forest Legacy Areas have been reduced in size to provide stronger focus to target areas in South Carolina. Under the Forest Legacy Program, South Carolina will continue to exercise both the option to purchase conservation easements and the option for fee purchase. As these resources are protected, many traditional values and uses of the forests will continue to be available. The AON represents a commitment to the conservation of all natural resources in South Carolina.

As appropriate, periodic review and revision of this assessment will be made to meet the future needs of this program in South Carolina.

John E. Frampton, Director
Henry E. Kodama, State Forester
South Carolina Department of Natural Resources
South Carolina Forestry Commission

ASSESSMENT OF NEED
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LIST OF MAPS AND FIGURES

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SOUTH CAROLINA FOREST STEWARDSHIP COORDINATING COMMITTEE
FOREST LEGACY SUBCOMMITTEE

The Forest Legacy Subcommittee shall consist of:

Two representatives from the South Carolina Department of Natural Resources
Two representatives from the South Carolina Forestry Commission
Two representatives from conservation groups
One representative from the Natural Resource Conservation Service
One representative from the Association of Consulting Foresters
One representative from the US Forest Service
One representative from the Tree Farm Committee

The current designees for such are:

Billy Dukes*	South Carolina Department of Natural Resources
Anna Smith*	South Carolina Department of Natural Resources
Ken Prosser	South Carolina Department of Natural Resources
Tom Swayngham	South Carolina Department of Natural Resources
Sam Chappelear	South Carolina Department of Natural Resources
Derrick Phinney	Clemson University Cooperative Extension Service
Russell Hubright*	South Carolina Forestry Commission
Scott Phillips*	South Carolina Forestry Commission
Chisolm Beckham*	South Carolina Forestry Commission
Rick Lint	Francis Marion & Sumter National Forests

Peggy Jo Nadler	Francis Marion & Sumter National Forests
Sara Green*	South Carolina Wildlife Federation
Sudie Daves-Thomas	Natural Resource Conservation Service
Wallace Wood*	Private forest landowner

*Also a SC Forest Stewardship Coordinating Committee Member

INTRODUCTION

From the mountains to the sea, South Carolina has a wide diversity of habitats, environmentally important areas, and scenic resources. Unfortunately, increases in urban sprawl and industrialization have led to a tremendous rise in residential and commercial development. Growing population densities and increasing land development trends across the state place economic pressure on South Carolina landowners to convert their forest land to other uses. Although efforts have been made to protect lands in South Carolina, the rate of development is far exceeding the rate of protection. The Forest Legacy Program will greatly assist South Carolina in offsetting this inequity.

South Carolina has been spending a great deal of time and money to protect vital habitats. The South Carolina Forestry Commission manages approximately 84,000 acres of state forests. In addition, the South Carolina Department of Natural Resources (SCDNR) currently has 49 Wildlife Management Areas (many of these also are national forests, heritage preserves or state forests) and 70 Heritage Preserves. The total acreage owned by SCDNR is approximately 270,000 acres. As part of the Wildlife Management Area program, SCDNR leases approximately 824,000 acres of land each year for wildlife conservation and management. This may seem like an outstanding accomplishment, but when one considers the expanding population in South Carolina, it is nowhere near enough. In fact, the amount of land leased into the Wildlife Management Area program has been significantly decreasing. This number is expected continue decreasing as the state population continues to increase and as timber corporations continue to dispose of property. The state population increased by about 9.9% from 2000-2007 to just over 4.4 million people. This was well above the national average of 7.2% for the same six year period. The South has been designated as the fastest growing region in the United States. Projections for 2015 and 2025 suggest a population of approximately 4.6 and 5.0 million respectively (U.S. Census Bureau, 2005). Of the 20.5 million acres in South Carolina only 12.9 million are forested; however if left unprotected, this will decrease as well with the projected population increase.

Whether it be a house at the beach or a cabin in the mountains, South Carolina has become a popular retirement and vacation destination. If something is not done to conserve the state's valuable resources, South Carolina will lose the qualities that make it such a unique place. Simply put, we can never do too much to protect our natural resources for future generations. As it has been quoted so many times, "We do not inherit the earth from our ancestors; we borrow it from our children."

Due to concerns about land-use changes and conversion to non-forest uses, the United States Congress established the Forest Legacy Program (FLP) as part of the Food, Agriculture, Conservation, and Trade Act of 1990 (P. L. 101-624: 104 stat. 3359) to promote long-term integrity of forest lands. The program's purpose is to identify and protect environmentally important forest lands threatened with conversion to non-forest uses through the purchase of conservation easements and fee-simple acquisitions. Through the Federal Agricultural Improvement and Reform Act of 1996 (P. L. 104-127: stat. 888), the Secretary of Agriculture is authorized at the request of the state to make a grant to the state to carry out the FLP in the state, including the acquisition by the state of lands and interests in lands. South Carolina will continue to exercise this option.

The Assessment of Need for South Carolina evaluates the potential need and use of this program in South Carolina; determines eligibility criteria for areas to be considered for the program within the state; identifies and describes the forest areas meeting these eligibility criteria; recommends all or parts of these areas for inclusion in the Forest Legacy Program to the Forest Service and the Secretary of Agriculture; and identifies the specific conservation goals and objectives for the Forest Legacy Program in South Carolina.

In order to protect our forests from such fragmentation, South Carolina has been divided into five Forest Legacy Areas (Map 1). These include the Foothills, Central Piedmont, Western Piedmont, Northern Coastal, and Southern Coastal Forest Legacy Areas. The original Forest Legacy Areas were based on the pre-existing Focus Area Initiatives, geology, political boundaries, and soil resource areas. The amended boundaries of these areas have been modified to remove large blocks of habitats that are protected through other programs and remove areas of the state where development pressures have either already consumed the forestland or increased the price of land to a point where it is not financially feasible to focus conservation efforts. The eligibility criteria remain basically the same as the original criteria. Minor modifications have been made for clarity.

The Forest Legacy Program will be used as a statewide approach to protect forests that are threatened with conversion to non-forest uses. Targets for protection will be focused and prioritized based on the ranking criteria. **Tracts that support ongoing conservation efforts, are adjacent to another protected tract, are along a river corridor or buffer a river system, and provide multi-faceted resource benefits will be given priority for acquisition. Special consideration will be given to properties that are designated as important by the Southern Forest Land Assessment, Focus Area Initiative or other conservation partnership, and that work to link existing conservation areas.**

Goals are outlined for each Forest Legacy Area based on the natural resources in that area.

Goals and Objectives for Foothills Forest Legacy Area:

- Encourage habitat enhancement through land purchase and sound forest management.
- Protect important historic and archeological sites.
- Maintain and enhance all significant forest types and their associated plant and animal communities.
- Increase public recreation opportunities.
- Protect scenic landscapes in the area, particularly along a designated scenic road or river.
- Protect areas designated as part of the Upper Savannah Focus Area Initiative or the Partnership for The Blue Ridge.
- Protect river systems, wetlands, and their associated upland habitats.
- Provide a connective corridor between existing conservation projects.

Goals and Objectives for the Central Piedmont Forest Legacy Area:

- Maintain and enhance the forests of the Piedmont Plateau and their associated plant and animal communities.
- Enhance the opportunities for public recreation.
- Protect the scenic landscapes within the area.
- Protect areas of historic and archaeological significance.
- Protect diminishing riparian corridors from further development; including the protection of river systems, wetlands, and their associated upland habitats.
- Protect areas designated as part of the Catawba Focus Area Initiative.
- Provide a connective corridor between existing conservation projects.

Goals and Objectives for the Western Piedmont Forest Legacy Area:

- Maintain and enhance significant examples of all forest types in the Western Piedmont. Forest Legacy Area and their associated high quality plant and animal communities.
- Protect riparian corridors and flood plains along the Savannah and Saluda rivers.
- Protect important historic and archeological sites.
- Maintain contiguous forest land by linking managed public and private lands.
- Encourage habitat enhancement through land purchase and sound forest management.
- Increase public hunting and other outdoor recreation opportunities.
- Protect the scenic landscapes within the area.
- Protect areas designated as part of the Upper Savannah and South Lowcountry Focus Area Initiatives.
- Provide a connective corridor between existing conservation projects.

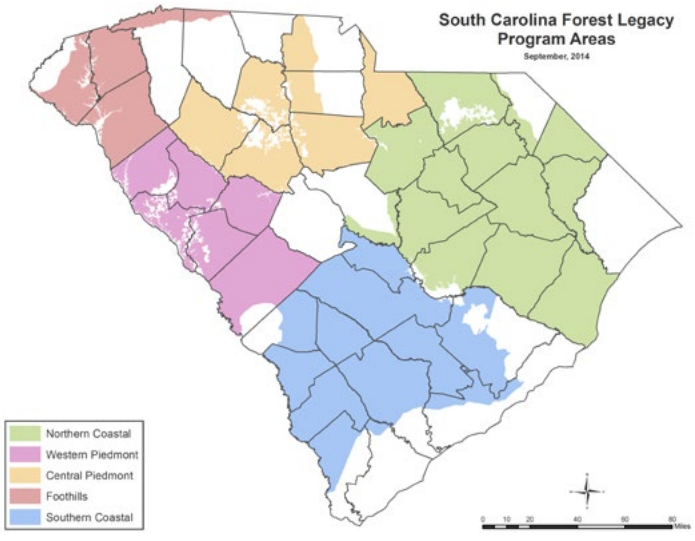
Goals and Objective for Northern Coastal Forest Legacy Area:

- Strategically protect lands to provide significant greenways along the river systems.
- Protect, maintain and enhance significant forested areas.
- Increase public recreation opportunities.
- Protect important cultural and archaeological sites.
- Protect the scenic landscapes within the area.
- Protect diminishing riparian corridors from further development; including the protection of river systems, wetlands, and their associated upland habitats.
- Protect areas designated as part of the Winyah Bay, Little Pee Dee-Lumber River, Great Pee Dee-Lynches River, Santee River, Upper Congaree-Santee-Wateree (COWASEE), Upper Waccamaw, and Santee Cooper Lakes Focus Area Initiatives.
- Provide a connective corridor between existing conservation projects.

Goals and Objectives for Southern Coastal Forest Legacy Area:

- Maintain and enhance the high quality of forest resources along with the associated plant, and animal communities.
- Maintain and enhance the bottomland hardwood areas located along major river systems.
- Protect historical and cultural resources.
- Protect areas inhabited by threatened and endangered species.
- Maintain contiguous forest land by connecting to managed public and private lands.
- Preserve the rural landscape and associated by-products that provide jobs.
- Provide opportunities for the public to have a place to enjoy various types of outdoor recreation.
- Provide opportunities for environmental education and research.
- Protect the scenic landscapes.
- Protect diminishing riparian corridors from further development; including the protection of river systems, wetlands, and their associated upland habitats.
- Protect areas designated as part of the Santee River, CAWS Basin, ACE Basin, South Lowcountry, and Santee Cooper Lakes Focus Area Initiatives.
- Provide a connective corridor between existing conservation projects.

Map 1. Revised South Carolina Forest Legacy Areas



I. South Carolina Forest Resources

Editor's Note: This data will be updated when the revised Forest Legacy Assessment of Need is completed.

A. Land Base and Forest Ownership

South Carolina is approximately 20.5 million acres in size with 19.2 and 1.3 million acres in land area and water area, respectively. As of 2008, it was estimated that forested lands totaled 12.9 million acres. This is slightly higher than previous estimates as the most recent FIA survey reported a slight increase in forestland extent, especially in the Pee Dee region of the state. Changes in inventory procedures and the increased use of technology likely account for some of the increase in acreage estimates. This change in forestland acreage prompted the South Carolina Forestry Commission to do a special five-county study in the Pee Dee to validate the FIA data. While this special study does not explain the reason for the increase in forestland area, the results do support the FIA area estimates derived from the current sampling procedures. (SCFC, 2008).

Forest industry has traditionally owned large blocks of forest land in South Carolina; however these corporations have recently begun divesting of some or all of their land holdings. International Paper made such a decision in 2005 and other large companies such as MeadWestvaco and in the process of identifying tracts for divestiture and development. In 2006, forest industries owned 1.4 million acres, which is down 29% and continuously decreasing. Due to limited financial resources, conservation groups are only acquiring a very small percentage of these lands. Some of the tracts are immediately being developed while others are being held by timber investment groups for undetermined periods of time.

Approximately 88% of SC's forests are privately owned. Nonindustrial private forest landowners control 74% of South Carolina's forests, and other significant forest land owners include the commercial forest landowners. Approximately 67% of private forest lands are family owned and the average "family forest" is 65 acres. Of these owners, 74% actually live on the land.

National Forests and other public ownerships represent the remaining 12% (SCFC, 2008). From these statistics, it is evident that the future of forest resources largely depends on the stewardship of the private citizens.

B. Population

Between July 2006 and July 2007, South Carolina ranked 10th in the nation and 5th in the region for highest percent

population change (SC Office of Research and Statistics 2007 State Population Estimates). To consider a longer period of time, from 1990 to 2005, the state's population increased 21.8% whereas the overall population of the United States increased 15.9% (Ulbrich and London, 2008). The July 2007 population estimated was just over 4.4 million people which yielded a 1.8% increase within one year whereas the national average was 1.0% and a 9.9% increase since 2000 whereas the national average was 7.2%. To compound the severity of this growth, South Carolina ranks 40th in size but 24th in overall population. (U.S. Census Bureau, 2007). AARP lists SC as second fastest growing in the South in terms of in-migrant retirees and in the top seven retirement locations in the nation. The South Carolina Department of Commerce projects that South Carolina's population will jump by over one million new residents within the next fifteen years with many believing this to be a conservative estimate based upon the expected jump in retiree rates when the baby boomers begin leaving the workforce. In fact, approximately 36% of South Carolina's population growth is a result of immigration. To compound this issue, studies by the Strom Thurmond Institute have shown that land is converted at a rate six times faster than the rate of population growth. With a growing statewide economy, rural forested areas continue to be converted to non-forested, urbanized landscape. Existing large tracts of forested lands are disappearing as the increasing population pushes development farther from cities, thus resulting in additional habitat fragmentation.

C. Forest Type and Distribution

South Carolina is fortunate to have a wide diversity of forest types. Physiographic regions range from the mountains to the ocean and include the Blue Ridge, Piedmont, Upper-, Middle-, and Lower Coastal Plains. A report prepared by John B. Nelson entitled "The Natural Communities of South Carolina - Initial Classification and Description" details sixty-seven different natural communities within the state. This report describes each community and provides their geographic locations, lists any potential elements of concern (threatened or endangered flora or fauna, noteworthy geologic structures, etc.), ecological dynamics, vegetative associations, brief comments, and references. Several of the major forest communities presented in the publication include: oak-hickory, pine-flatwoods, pine savannah, pocosin, cypress, and bottomland hardwood. Several unique communities harbor threatened or endangered flora and fauna, or have significant geological features.

Forest acreage declines in the mountain and coastal forest types are a direct result from construction of residential and vacation homes, golf courses, and the development of resorts. Because of a high demand for scenic vistas, both mountain and coastal properties are being converted to non-forested areas faster than other areas. Lands within the Piedmont and Upper Coastal Plain also are being converted to commercial and industrial uses as well as residential areas. Many quality forested areas have been purchased as investment properties by land speculators for future conversion.

D. Forest Product Composition

Timberlands within South Carolina are generally classified into three broad categories: hardwoods, softwoods, and oak-pine. In 1970, softwoods, oak-pine, and hardwoods tallied 5.5, 1.8, and 5.1 million acres, respectively. In 1993, hardwood acreages had declined to fewer than 5.0 million acres while oak-pine stands accounted for over 1.9 million acres, and softwoods dominated with about 5.6 million acres. The increase in softwood acreages since 1986 can be linked to the aggressive planting of plantation pines (33% increase) utilizing programs such as the Federal Conservation Reserve Program of the 1980s. A major portion of those planted acres are a direct result of attempts to restock areas heavily damaged in 1989 by Hurricane Hugo. Forest estimates for 2003 suggest that the majority of forest land in South Carolina is loblolly-shortleaf pine (40%) followed by oak hickory (20%), oak-gum-cypress (19%), oak-pine (15%), longleaf-slash pine (5%), and other (1%) (USFS, 2003). Many experts are concerned, however, that this acreage will dramatically decrease as focus turns to ethanol production and potential incentives to produce agricultural products such as corn.

E. Forest Wildlife

A wide diversity of habitats allows for numerous wildlife species to be found within the state. Whether it is one of the 150 species of birds that nest here or one of the many mammals that roam the countryside, South Carolina is fortunate to house many types of wildlife. In addition to huntable populations of Eastern wild turkeys, white-tailed deer, wood ducks, small game, and furbearers, the state has many non-game species as well as 23 animal species that are currently listed as federally endangered or threatened. Many wildlife species throughout the state depend on

having different types and age classes of timber in which to live and feed. As certain types of habitats are decreased or lost, so are the wildlife species associated with them.

Isolated black bear populations exist in the Northern and Southern Coastal Forest Legacy Areas; however, the largest population occurs in the Foothills Forest Legacy Area (FFLA). From an estimated population of 1,000 black bears in this area, a total of fifty-eight bears were legally harvested in 2007. Because black bears are known to have a large home range and may travel several miles daily, it is imperative that large contiguous blocks of undeveloped forest habitat be maintained. Hardwood mast production is extremely important to black bears. In years of poor mast production, the movement patterns of these animals may significantly increase as they expand their range in search of alternate food sources. Forest habitats in early successional stages are particularly important during years of poor mast crops. Increased development, forest fragmentation, and increasing human populations have resulted in additional human-bear conflicts, and biologists expect these problems to increase further as available habitat continues to decrease.

White-tailed deer are abundant across most of the state with lower population densities within the Foothills Forest Legacy Area (FFLA) and the northern portion of the Northern Coastal Forest Legacy Area (NCFLA). Current populations are largely the result of past restoration efforts. White-tailed deer were trapped in the Southern Coastal Forest Legacy Area (SCFLA) and relocated in the Piedmont Legacy Areas, the FFLA, and the NCFLA from the 1950s to the 1980s. Combined with restrictive bag limits and diligent law enforcement, South Carolina has one of the longest hunting seasons and largest harvests per unit area in the United States. White-tailed deer can be found utilizing many different habitats, including forest regeneration areas, early age timber stands, and older aged hardwood stands. The estimated deer population in 1960 was between 60,000 and 80,000 animals. Today, South Carolina has an estimated deer population of 725,000 animals. The statewide deer harvest in 1972 was approximately 20,000 animals; however, the number harvested in 2007 was approximately 215,000 animals. Similar to the situation described with black bear, increased human encroachment and habitat fragmentation unfortunately will result in deer-human conflicts.

Another success story in South Carolina is the restoration of the Eastern wild turkey. Populations of the birds dwindled by the turn of the last century with only small numbers of birds being present in the Coastal Forest Legacy Areas. During the 1950s turkeys were trapped from the Francis Marion National Forest and released in the Piedmont and Foothills Forest Legacy Areas. These birds did well and served as stock for restoration efforts in Coastal Forest Legacy Areas that began in the mid-1970s. With an estimated 19,289 birds harvested in 2007, huntable populations were found in every Forest Legacy Area of the state. The estimated population to date is approximately 90,000 birds. In fact, every county in South Carolina now has a spring turkey hunting season.The restocking efforts and resulting population growth has been so successful that South Carolina has assisted several other states in reestablishing huntable populations by providing them with over 1,700 birds for restocking. Forested habitats are utilized extensively by the wild turkey with clearcuts, thinned areas, and young pine stands providing brood rearing habitat, nesting cover, and escape cover. Older stands of hardwood and mixed pine-hardwood and their mast production are important to the wild turkey. River drainages and their associated hardwood components are extremely important as travel corridors, allowing for movement of turkeys from one habitat type to another.

Northern bobwhite, American woodcock, ruffed grouse, swamp rabbit, marsh rabbit, cottontail rabbit, and gray squirrel are also important wildlife species in South Carolina. Most of these species are associated with several seral stages of forest habitat. Implemented properly within a good forest management plan, clearcuts, thinned stands, young stands, and mature forests each can provide life requisites of small game species. Regionally, bobwhite quail populations are low across the Southeast, due to change in land use have decreased or eliminated suitable habitat. Ruffed grouse distribution is limited geographically to the Blue Ridge Escarpment in the northwest corner of the state. Northern bobwhite, American woodcock, ruffed grouse, and swamp rabbit are listed as priority species under South Carolina's Comprehensive Wildlife Conservation Plan.

South Carolina has 23 animal species and 19 plant species that are federally threatened or endangered (Appendix D). Threatened and endangered species such as the flatwoods salamander, bog turtle, bald eagle, and red-cockaded woodpecker can be found in South Carolina. These species are closely associated with specific ecological communities and have attained their listing mostly because of the conversion of their habitats to other uses.

The red-cockaded woodpecker (RCW) is one of the most

recognized endangered species associated with forested areas. Colonies of these birds are found almost exclusively in the old growth pine forests of the southeastern United States. In South Carolina, the RCW is located primarily within the Coastal Forest Legacy Areas. The RCW requires mature pine forests over 60 years old, which are fairly open and have little hardwood understory, and is the only woodpecker that excavates a cavity in a living tree.It is estimated that there are approximately 1,000 groups (a group is defined as a breeding male and female, sometimes including one or more helper birds that assist the breeding pair) in South Carolina.

Forty percent of these groups are located on privately owned lands. Although RCW groups on private lands in South Carolina have been stabilized to some extent through the use of Safe Harbor agreements, which encourage landowners to maintain and enhance RCW habitat, many groups are still threatened by habitat alteration and forest fragmentation. Throughout South Carolina, RCW groups are threatened by urban sprawl, which greatly limits or negates the ability of forest managers to conduct proper management practices, such as prescribed burning. The trend towards cutting timber at a shorter rotation has also greatly diminished the suitable habitat necessary for the red-cockaded woodpecker.

The bald eagle is the largest bird of prey found in South Carolina. With the Endangered Species Act, the eagle has rebounded from all-time lows that occurred in the 1960s and 1970s.In 1977, only 13 breeding pairs existed in the state; however, 222 active breeding pairs were documented in 2007.Only nine young were fledged in 1977 as compared to 315 being fledged in 2007.

The majority of the active nests are found within the Northern and Southern Coastal Forest Legacy Areas. Eagle nests are usually found near water, such as along major river drainages throughout the coastal areas. Most eagle nests are constructed in large pine trees. These larger sized pine trees can be hard to find in habitats that are conducive to eagle nesting. The bald eagle was taken off the Endangered Species list in 2007 and is now protected by the Bald and Golden Eagle Act of 1940

The fox squirrel is another important wildlife species in South Carolina. A survey revealed 418 individual fox squirrel sightings in twenty-one different counties across the state. Habitat types in which the sightings occurred were: pine/hardwood >50 years old (19%), mixed pine hardwood 30-50 years old (18%) pine sawtimber (%),or other open field (15%), pulpwood sized pine plantation (11%), pine/hardwood <30 years old (%),pine plantation <15 year old (5%) and other sites (%).As the data indicates, fox squirrels use older growth type timber stands. Part of the decline in fox squirrel numbers throughout the Southeast can be attributed to urban sprawl, agribusiness, and the current trends in the forest industry that favor young, short rotation age pine stands.

The Forest Legacy Program provides an excellent opportunity for South Carolina to acquire and properly manage needed habitats for the continued survival of all wildlife, both hunted and protected. South Carolina has leveraged the Forest Legacy Program with state and other federal funding sources to target large-scale conservation projects that meet a diverse range of wildlife conservation objectives. Acquisition and management by the state is one of the only ways that many critical habitats will be protected from development and enjoyed by future generations.

F. Recreation

South Carolinians are very fortunate to have tremendous outdoor recreational opportunities. Currently, there are 4 state forests, 7 national wildlife refuges, 2 national forests, 70 heritage preserves, 46 state parks, 49 wildlife management areas (many of these also are national forests, heritage preserves or state forests), and 1 national park that offer some form of public outdoor recreation. In addition to these public outdoor recreational opportunities, many people also enjoy outdoor activities on private forests. Hunting is one of the most common forms of outdoor recreation on private lands.

South Carolina's forests and wild lands offer some of the best hunting in the Southeast both in terms of game populations and opportunities. Recent studies have shown that 203,000 sportsmen are taking advantage of those opportunities by spending $308,731,000 annually. Wildlife watching also is a significant form of outdoor recreation with 1,133,000 participants spending $482,659,000 annually. A recent survey by the US Fish and Wildlife Service further revealed that the total wildlife associated recreation contribution to the state's economy by residents and nonresidents was $2.5 billion. In the same respect, fishing also significantly influences the state's economy. On an annual basis, fishing normally accounts for around 789,000 participants spending approximately $1,323,990,000 (U.S. Fish and Wildlife Service, 2007).

South Carolina's forests also offer excellent back country camping and trail use opportunities. There are thousands

of miles of hiking, biking, canoe, and equestrian trails that traverse mountains, rivers, swamps, Carolina bays, state parks, national wildlife refuges, national and state forests, coastal preserves, and other unique and interesting landscapes. One of South Carolina's most visited hiking trails is the Foothills Trail in Greenville, Pickens, and Oconee Counties. This trail offers more than 100 miles of backcountry beauty from Jones Gap State Park to Oconee State Park. The growing popularity of forest based recreation is evidenced by the growing list of guides, books, and maps covering a cross-section of outdoor activities. Approximately 30 million people visit South Carolina annually including over 700,000 Canadians and about 150,000 overseas visitors. These visitors spent an estimated $9.1 billion while traveling in the state in 2006 which results in a 6.9% increase over 2005. Tourism directly generates 6.3% of the state's employment base or 119,800 jobs. If you include indirect and related impacts generated by tourism spending, tourism is the catalyst for 198,900 jobs. Twelve of SC's forty-six counties received over $100 million in domestic travel expenditures in 2006, and thirteen counties indicated 1,000 or more jobs directly supported by domestic travelers during 2006. South Carolina ranks 23rd among the 50 states for travel expenditures by domestic visitors which is significant when one considers the lower cost-of-living in South Carolina (Travel Industry Association, 2007).

G. Aesthetic and Scenic Resources

Traditionally, our ancestors viewed forests as a source of wood products and food. As society has changed and become more affluent, the values placed on forests expanded to include wildlife, clean water, and beautiful vistas. A recent survey, that included respondents from South Carolina, examined attitudes toward certain aspects of forest management. The results indicated that landowners chose scenic enjoyment as the second most important benefit, following wildlife appreciation, derived from their forest land (Yarrow et. al. 1996)

Outstanding examples of the natural beauty of the Southern Appalachians are ubiquitous in the mountains of Pickens, Oconee, and Greenville Counties. In this area, natural beauty lies in the vistas at Jumping-Off Rock and Pretty Place over looking large unbroken expanses of oak-hickory forests, gorges with swift moving streams and rivers, spectacular waterfalls such as Lower White Water Falls, Laurel Fork Falls, and Raven Cliff Falls and incredible granite outcrops at Table Rock Mountain, Caesar's Head and Glassy Mountain. In the fall, tourists flock to South Carolina's mountains to view fall colors. Similarly, spring brings beauty in the form of blooming wild flowers. Many of these sites can easily be accessed from the South Carolina Scenic Byway (SC Hwy 107) and the Cherokee Foothills Scenic Highway (SC Hwy 11).

The 115 mile Foothills Scenic Highway runs from near the Georgia border east to Gaffney in Cherokee County. Some of the more scenic locations along the route include spectacular views of Table Rock Mountain and Caesar's Head Mountain. Scenic locations such as Lake Jocassee and several state parks are only a short side trip from the Foothills Highway. This is a great I -85 alternative for tourists traveling through South Carolina. Because of its aesthetically pleasing views, this area is also seeing a tremendous rise in commercial and residential development.

One of the more prominent natural attractions to this area is the Chattooga National Wild and Scenic River located in the Andrew Pickens District of the Sumter National Forest. This river offers some of the most challenging white water paddling in the Eastern United States. Additionally, the Chattooga's beauty attracts thousands of eco-tourists and trout anglers.

Gently rolling terrain with pine and mixed pine-hardwood forests are characteristics of South Carolina's Piedmont Plateau. Within this area there are several significant scenic areas including the Long Cane, Tyger, and Enoree Ranger Districts of the Sumter National Forest. These Districts contain some outstanding examples of mature mixed pine-hardwood communities that many consider the most aesthetically pleasing Piedmont landscape. The Broad, Middle Saluda, and Lower Saluda Rivers all flow through this part of South Carolina. While these are not the only Piedmont rivers that offer scenic beauty, they all have been deemed worthy of Scenic River status bestowed by the South Carolina Legislature.

The natural beauty of South Carolina's Coastal Plain is most often associated with tidal marshes, maritime forests, undeveloped beaches, and relatively undisturbed black and red river swamps and associated forests. One of the finest examples of a near-virgin southern hardwood forest is the Congaree Swamp National Park situated in the Congaree River floodplain. This 22,000 acre tract is truly a national treasure and one of the most beautiful natural areas in South Carolina and is currently South Carolina's only National Park. The park preserves the largest expanse of old-growth, flood plain forest in America and has been

designated as a South Atlantic Coast Biosphere Reserve. A walk through this area is to go back in time and visit a pre-colonial pristine, southern bottomland hardwood forest.

Many of the slow moving rivers flowing through the Upper Coastal Plain dissect some healthy forests. All Coastal Plain rivers have segments that are aesthetically pleasing. However, some of the best examples of unspoiled river corridors are found on Lynches River and Little Pee Dee River. Portions of these rivers are so outstanding that they have been designated by the state as Scenic Rivers.

South Carolina's ACE Basin contains exemplary examples of Lower Coastal Plain beauty. Strong, black, and clean, the Ashepoo, Combahee, and South Edisto Rivers flow from their inland origins into South Carolina's resource-rich St. Helena estuary. Together these rivers combine to drain a large portion of South Carolina's Lowcountry and support a diversity of life unmatched in North America. Included in this area is over 300,000 acres of coastal plain communities, typically associated with barrier islands, marsh islands, and estuarine rivers. The beauty of the area is the physical landscape, flora and fauna associated with salt marshes, brackish marshes, tidal flats, maritime forests, bird keys and banks, and mixed pine-hardwoods.

South Carolina is fortunate to have approximately 200 miles of coastline. Since the turn of the century, most beaches have been developed as resorts; however, there are still unspoiled beaches associated with undeveloped barrier islands. These beaches and associated habitats are very different from beaches that most people visit. The ecological value of these undeveloped beaches is the undamaged dune structure and the considerably richer and more diverse flora and fauna. Most people that have had the privilege of visiting South Island, North Island, or another of South Carolina's few undeveloped beaches would probably agree that the real aesthetic value lies in the simple things such as finding a piece of driftwood or a sunrise without a hotel in sight.

South Carolina has some of the most diverse and aesthetically pleasing landscapes in the United States. South Carolinians and visitors greatly value and appreciate the state's natural beauty and quality of life. Ongoing vigilance and hard work by natural resource managers and strong support from the public will ensure that South Carolina will continue to rank high on the list of states with outstanding scenic resources.

H. Economics

Timber is South Carolina's most valuable crop with landowner receipts totaling over $514 million per year. Numerous individuals and communities throughout the entire state rely on the forest to provide jobs as well as a quality of life. The forest industry ranked 1st in employment among all manufacturing industries in South Carolina and employed approximately 44,708 people with a payroll of $2.4 billion. South Carolina exports about $1 billion in forest products annually, and forest industry has an economic impact of over $17.45 billion annually to the state's economy. This makes it rank second in value added goods among the state's manufacturing sectors. These forests also provide more than just wood and fiber to the economy. By products such as the collection and sale of pine straw can mean jobs for individuals located in these rural settings. Timber is the state's top agricultural commodity and produces approximately $870 million annually (SCFC, 2008).

In addition, approximately 39% of South Carolinians participate in wildlife-related recreation. Whether it is hunting, hiking, or bird watching on these forests, equipment and supplies used in these activities bring in dollars to the local economy that might not otherwise be available. In 2006, hunting expenditures brought in $308 million dollars and wildlife watching activities brought in another $482 million to the local economy throughout the state (U.S. Fish and Wildlife Service, 2007). These activities would not be able to take place if there were a lack of forested areas throughout South Carolina.

Maintaining sustainable forestry is vital to the economy, and it is the livelihood and way of life for many citizens throughout the state. Even though public owned forests account for only 10% of the total forested areas within the state, these areas are important for public recreation, wildlife habitat, revenue, and numerous other activities, especially as the population of South Carolina becomes more urban.

South Carolina's renewable timber resource has served as a basis for a strong rural economy and generated considerable wealth for South Carolina through direct and indirect expenditures. Forests should continue to be the foundation of one of the most important manufacturing sectors in the state, subsequently providing forest products for the regional, national, and global marketplace.

I. Urban Influences

South Carolina is one of the fastest growing states in the United States and the Southeast. A 2007 population update indicates that South Carolina ranks 10th in growth

nationally and 5th regionally (U.S. Census Bureau, 2007). Much of this development and growth results in a loss of productive forest lands. From 1992 to 1997, South Carolina ranked 9th among 50 states in the rate of conversion of agricultural and forest lands (Ulbrich and London, 2008).

Productive forests not only are economically important but also have critical environmental values. A study by Clemson University's Department of Planning and Landscape Architecture examined the changes during a 10-year period (1988-1998) within a 600,000 acre watershed in upstate South Carolina. The study found that impervious surfaces such as pavement increased by 11,000 acres during the study period. This additional hardscape resulted in a 9% increase of surface runoff. Surface runoff is a major contributor to non-point source pollution and results in substantial infrastructure mitigation costs.

Research has shown that significant forest lands in close proximity to large cities can have a positive impact on air quality and energy usage. In fact, studies have shown that commercial, industrial, farm, and forest property consistently generate far more revenue than costs (Ulbrich and London, 2008) A California study found that urban forests in the Sacramento area annually removed 300,000 tons of carbon dioxide (McPhearson, 1998). This reduction in atmospheric pollution represents an implied value of $3.3 million. In addition, many newcomers to each region in SC desire to have parks and recreation areas where they can walk, hunt, and enjoy the outdoors.

Much of the growth in South Carolina is classified as a sprawl pattern (the remote, unplanned, and uncoordinated residential development on large lots of land). This has an even more dramatic impact when one considers that the number of housing units in SC increased 35.4% from 1990 to 2005. This is well above the national average of 21.8% for the same time period. Considering that the SC population for that period increased 21.8%, much of the increase in housing is attributed to smaller households and second homes (Ulbrich and London, 2008). At the current growth rate, problems associated with urbanization will increase. This heightens the need for forest lands in close proximity to metropolitan areas especially as many of the faster-growing areas are already experiencing problems with ambient air quality due to traffic flow on roads. While the Forest Legacy Program in South Carolina will attempt to focus on tracts near expanding urban areas, it is important to note that all areas in the state are within 50 miles of an urban area, and if they are not already converted, they are threatened by conversion in the near future.

J. Unique Natural Areas

The importance of natural areas was recognized by scientists in the early twentieth century. Soon after this realization, interest in the preservation of forested natural areas began when U.S. Forest Service suggested natural area status for a number of areas within National Forest Service Lands. The first "Natural Area" was formally designated in 1927. Today the Society of American Foresters (SAF), through a Committee on Natural Areas, continues to provide leadership in establishing and maintaining natural areas. The goal of this program is to provide representative samples of undisturbed major forest types. In South Carolina the SAF has identified and designated 15 areas across South Carolina as Natural Areas (Map 2: Note that Congaree Swamp Natural Area is not depicted on map).

Map 2. Society of American Foresters Natural Areas Program

In addition to the SAF, the South Carolina Department of Natural Resources has a well-developed land acquisition plan through the Heritage Trust Program. This program was created in 1976 to preserve natural and cultural remains that were quickly disappearing. The goal of natural feature preservation is to inventory and protect the elements considered the most outstanding representatives of our state's unique and natural areas. To date, the Heritage Trust Program has acquired over 70 properties that have unique elements. Many of these properties are purchased to protect rare, threatened or endangered plants and animals or to protect critical habitats. Through this program, examples of South Carolina's most unique natural areas have been protected. Some of the most notable Heritage Preserves include Laurel Fork, Lewis Ocean Bay, Lynchburg Savanna, Longleaf Pine, Bunched Arrowhead and Rock Hill Blackjack. The 1,000-acre Laurel Fork Heritage

Preserve in Pickens County is part of a larger acreage that holds the largest number of natural elements in the state. In addition to rare elements, this site contains trout streams, river gorges, and scenic waterfalls. The Lewis Ocean Bay Heritage Preserve in Horry County contains a group of 20 undisturbed Carolina bays that are the epicenter of South Carolina's Coastal Plain black bear population. Additionally, this 9,647-acre site includes a pond pine pocosin plant community, habitats for the endangered red-cockaded woodpecker, the threatened Venus' flytrap, and a rare Savannah milkweed. The 291-acre Lynchburg Savanna in Lee County is classified as a wet, longleaf pine savannah habitat. Containing at least 10 carnivorous plant species, this habitat type is considered the most biologically diverse and imperiled ecosystem in North America. Also in Lee County is the 843-acre Longleaf Pine Heritage Preserve. This longleaf pine forest supports habitat for the federally endangered red-cockaded woodpecker and Canby's dropwort. The 176-acre Bunched Arrowhead Heritage Preserve in Greenville County is particularly unique in that it harbors one of the largest populations of bunched arrowhead (Sagittaria fasciculata). And finally, the 289-acre Rock Hill Blackjacks in York County may be the last remnant of a once flourishing prairie system in South Carolina. This site also happens to be the only location where the federally endangered Schweinitz's sunflower enjoys permanent protection.

In addition to Heritage Preserves, the SCDNR also manages 49 Wildlife Management Areas. In total, SCDNR owns approximately 270,000 acres and leases an additional 824,000 acres through the Wildlife Management Area program. A tremendous amount of unique, natural habitat can be found in these Wildlife Management Areas. South Carolina is very fortunate to have a mechanism to preserve unique and natural areas; however, there are still many additional natural areas and rare elements in need of protection.

K. Fisheries, Rivers and Streams

Forests are an important component of the aquatic systems in South Carolina. Failure to protect these areas has implications far greater than the immediate site. The Land and Water Resources Division of the South Carolina Department of Natural Resources estimates that there are over 11,100 miles of rivers and streams within the state. Of this total, 3,538 river miles are important to inland fisheries. These aquatic ecosystems provide feeding, spawning, and nursery grounds for a variety of resident and migratory fish. There are approximately 150 species of fish in the fresh waters of the state. These inland fisheries are made up of game fish, rare and endangered species, nongame fish, and fish of high commercial value. Species such as trout are found only in cold water systems, while other species such as the bluespotted sunfish live in the blackwaters of Coastal Plain streams (Beasley et. al., 1988).

Rivers and streams in South Carolina often are characterized by the location of their watersheds. Blackwater streams primarily drain lands from the Coastal Plain. Typically, these systems drain poorly buffered soils and are acidic due to the decomposition of leaf litter. Tannins resulting from decomposition give these streams a stained appearance. Blackwater streams typically have extended stretches through alluvial swamps where the main channel is obscured after braiding out into multiple smaller channels. Streams and rivers originating above the fall line are sometimes referred to as Piedmont streams, red rivers, or brown rivers. These rivers typically discharge larger watersheds than coastal streams and attain a higher stream order. Piedmont rivers often carry high sediment loads resulting in a red or brownish color.

Riparian zones are an important component of all streams and rivers in South Carolina. Riparian ecosystems are areas of vegetation adjacent to or within streams and rivers extending onto the floodplain. A dominant type of riparian ecosystem in South Carolina aside from alluvial swamps is the bottomland hardwood forest. Flora associated with this ecosystem are adapted to seasonal inundation for at least part of the year. There are many benefits of riparian ecosystems to adjacent rivers and streams. Alterations in the riparian zone can have negative effects on the aquatic community.

Primary production in streams comes largely from allochthonous sources rather than photosynthetic production of phytoplankton within the water column. Riparian vegetation provides leaf litter and detritus to streams that serve as a food source for aquatic invertebrates and ultimately provides food for fish communities. Also, large woody debris in streams serves as a substrate for aquatic invertebrates and provides cover for fishes. Additionally, the large woody debris can provide spawning habitat for certain fish species. Davis (1972) and Bass and Hitt (1974) observed redbreast sunfish (an important game fish in South Carolina coastal streams) preferred to nest adjacent to snags and woody debris in North Carolina and Florida, respectively.

In addition to reproductive habitat, riparian ecosystems

also provide shading to the underlying stream systems. Clearing trees along a stream bank will result in increased water temperatures during summer months (Cobb and Kaufman, 1993) which affects spawning habitat for indigenous fishes. Also, the removal of the canopy along a stream can cause a shift in primary production from aquatic invertebrate communities to autochthonous production of single celled phytoplankton and consequently can be detrimental to fish species that rely on riparian habitats for food and reproduction.

Riparian ecosystems control erosion and sedimentation in streams and rivers. Vegetation along stream banks can stabilize the channel with root mass and the deposition of large woody debris. Riparian vegetation stabilizes floodplain soils and slows overbank flooding, allowing deposition of alluvium onto the floodplain rather than in the stream channel. Excess sedimentation in streams can affect fish spawning by covering nest sites and feeding behavior by changing visibility within the water column.

South Carolina's rivers and streams are some of the state's most important natural resources. One of the best ways to protect them, however, is through proper forest management. Not only are our rivers ecologically critical, but they have tremendous economic significance. The management of our river resource is so complex that it is beyond the capabilities of any single organization or program. Continued sound management of this resource will require cooperative partnerships and shared responsibility between public and private interests (Beasley et. al. 1988).

II. Related Resources

A. Geology, Topography, and Other Geologic Features

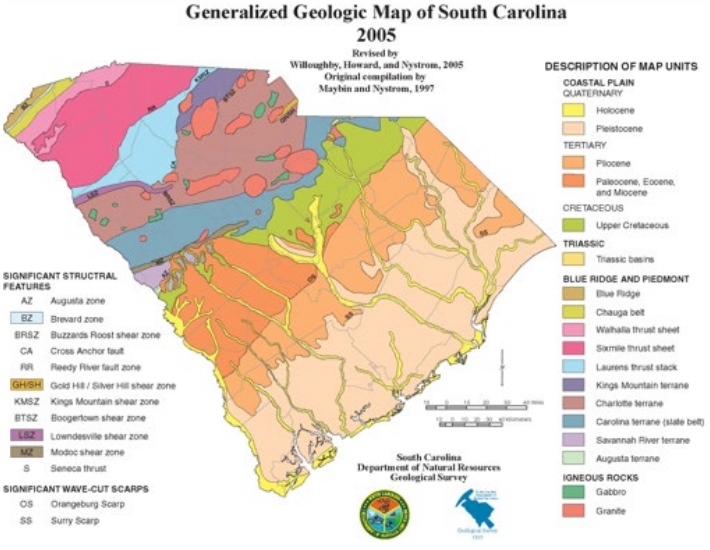
There are three distinct physiographic and tectonic provinces in South Carolina: the Blue Ridge Mountains, Piedmont, and Coastal Plain (Map 3). These three provinces are unified by a combination of rock type, structural history, and other geologic criteria. These geologic criteria are the non-biological building blocks for entire ecosystems.

The portion of the Blue Ridge Mountains in South Carolina is 90 miles long, 25-30 miles wide, and located in the northwest corner of the state. This area is a series of deep valleys and river gorges flanked by steep northeast trending mountain ridges. The Blue Ridge Mountains contain the oldest (1.2 billion years old) rocks in South Carolina. The Brevard fault zone is a northeast thrust/fault structure (Chattooga Ridge) that separates the Blue Ridge province from the Piedmont province and can be traced along the eastern edge of the Appalachian Mountains.

The Piedmont (French word meaning "foot of the mountain" consists of rolling hills and valleys. The region contains the roots of an ancient, eroded mountain chain and is generally hilly with thin, stony clay soils. Much of this area was once farmed; however the area has primarily been converted to timber production. The southern edge of the Piedmont is the fall line, where the rivers drop into the coastal plain.

The Coastal Plain is southeast of the Piedmont and extends to the Atlantic Ocean with few changes in elevation. The oldest sediments in the Coastal Plain date back 86 million years. Carolina bays are depressions found in the Coastal Plain of South Carolina. Geologists theorize they may have been formed by prevailing southwesterly winds. Consequently, these winds carved ovate-like beds with their long axis oriented northwest-southeast. Undisturbed Carolina bays have distinctive biological communities. The vast majority of Carolina bays in South Carolina have been ditched and drained for agriculture, development, and other uses. For those that remain, there is a growing appreciation of the role Carolina bays play in the Coastal Plain's ecology and hydrologic framework.

Map 3. Generalized Geologic Map of South Carolina



B. Soils

Soil is the basic foundation of any terrestrial ecosystem and sustains forests in many ways. Trees need soil because it stores, provides, and recycles nutrients; stores water;

provides oxygen for roots; and provides physical support. There are 265 different soil types that are currently recognized in South Carolina. Most of these are considered forest soils because they developed under forest vegetation. The variation in the soils of South Carolina can best be described by geographic regions outlined by USDA-NRCS as Major Land Resource Areas:

- Blue Ridge - steep to gently sloping soils, often shallow to bedrock.
- Southern Piedmont - steep to gently sloping, may be deep or shallow to bedrock.
- Carolina Sand Hills - broad, flat ridges and steep slopes.
- Southern Coastal Plain - broad, flat plains with occasional ridges, slight differences in elevation results in major soil differences.
- Atlantic Coast Flatwoods - similar to Southern Coastal Plain, except lower in elevation and water table closer to the surface.

Massive soil erosion has occurred in the Piedmont and Blue Ridge areas. This erosion has been largely due to poor farming and timber harvesting practices resulting in water and wind erosion. Currently, the greatest soil losses are a result of industrial and housing development. Properly managing a forest is one of the best methods of preventing erosion of soil.

C. Agriculture

The amount of land in agriculture has remained relatively constant between 1997 and 2002. In 2002, there were approximately 24,541 farms in South Carolina totaling approximately 4.8 million acres compared to 1997, when there were approximately 25,807 farms totaling approximately 4.9 million acres. This leveling is taken as a positive sign since the period from 1982 until 1997 saw an 18% decrease in agricultural acreage. (South Carolina Office of Research and Statistics, 2007)

South Carolina has a diverse mixture of agricultural fields and forest lands, which create habitat for most wildlife species. The Forest Legacy Program is designed to conserve working forests in that landscape, and many farmers depend on the economic option to harvest timber to supplement their income. Agriculture and forest land uses complement each other in South Carolina, but rural lands are being replaced with non-forest and non-agricultural uses. The Forest Legacy Program allows up to 25% of the conserved property to remain in non-forest production. Flexibility such as this creates numerous opportunities to combine sound forest management and agricultural production.

D. Mineral Resources

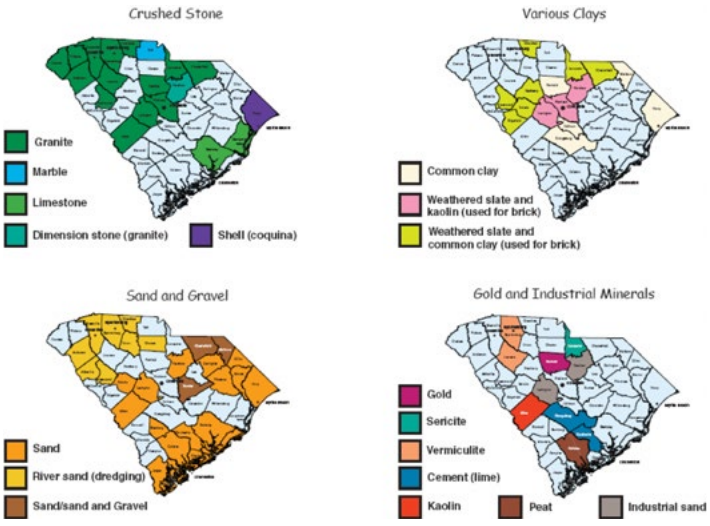
South Carolina is rich in non-fuel raw minerals with a total of over $659 million produced in 2005. The most common minerals produced in South Carolina are: cement, clays, gemstones, peat, sand, gravel, and crushed stone (Maps 4 and 5). In 2005 South Carolina was the top producer of vermiculite, ranked third in masonry cement, eighth in common clays, second in kaolin, and fourth in crude mica (USGS, 2005).

E. Cultural Heritage Resources

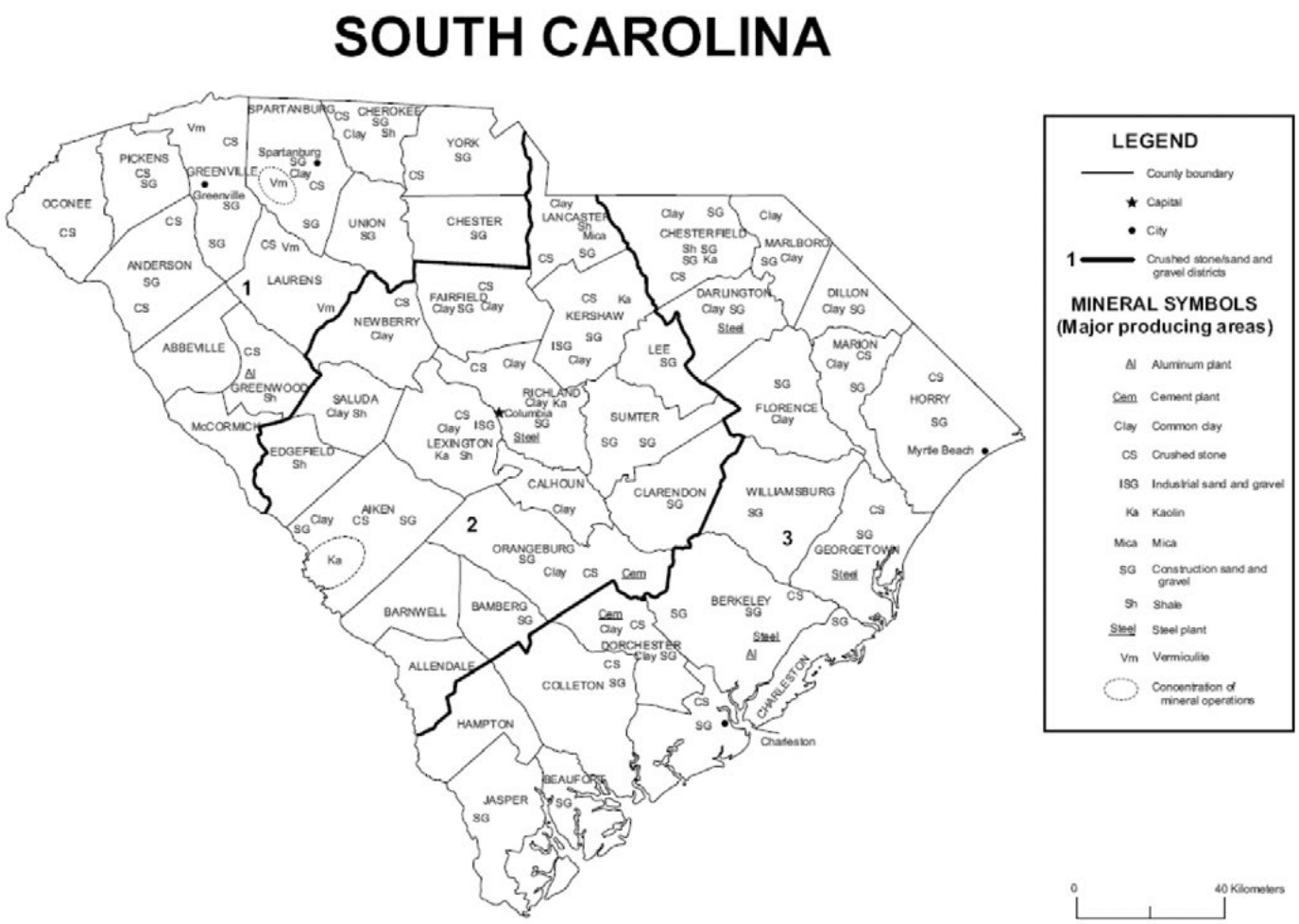
South Carolina has been inhabited for over 12,000 years. About 5,000 years ago humans were making clay vessels, and about 3,500 years ago they used the bow and arrow, and lived in semi-permanent to permanent villages. About 1,000 years ago, humans in South Carolina lived in large palisade villages surrounding a mound and produced domesticated crops such as corn, beans, squash, and pumpkins. Many historic period occupations are unique to South Carolina such as the French Charles Fort of 1562 and the Spanish town of Santa Elena during the period of 1566-1587.

Archaeological sites have been recorded in South Carolina spanning from 12,000-year-old campsites to 1950s era farmsteads and military installations. To date, only a small fraction of sites have been investigated by professional archaeologists. Unlike natural resources, cultural resources are non-renewable. Because many cultural resources in

Map 4. South Carolina Mineral Production Data by County



Map 5. South Carolina Mineral Resources by County



Source: South Carolina Geological Survey/U.S. Geological Survey (2005)

South Carolina are linked to forested land, protecting forest land from non-forest use will better protect South Carolina's cultural resources.

III. Critical Issues

A. Fragmentation

As human populations increase, the necessity for space to accommodate our needs and desires also increases. Many individuals want to move from the city and into the more tranquil setting of a subdivision where there is still some resemblance of a forest. These subdivisions are usually tracts of wooded areas that were once forests but have now been transformed into somewhat large lots (1/2 to 1 acre) where a house can be surrounded by a few trees. As the demand for this type of setting is increasing, more forest land is bought by developers, sub-divided, and sold for a premium price.

Fragmentation of forest land is occurring as landowners are offered large sums of money for their forested property. A property owner may sell all of the forested property or just a prime portion to developers. As the size of the forest decreases so does the biodiversity that is unique to that specific area. Meanwhile, an adjacent property owner who enjoys the forest and its associated benefits refuses to convert his property into some type of development. The end result is a patchwork type pattern that goes from forest to non-forest to forest and back again. This results in large contiguous forest lands being broken into smaller tracts. This in turn leads to habitat loss, threatens water quality, and decreases biodiversity. Once development has occurred, the ability to manage the adjacent forest becomes limited.

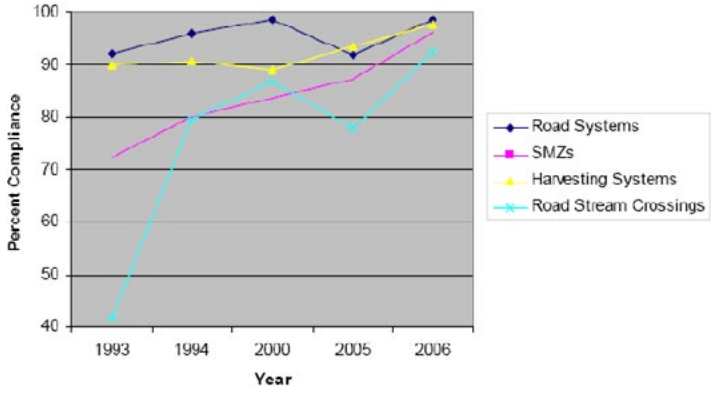
B. Sustainable Forests and Timber Harvesting

Sustainable forestry includes many components that are all needed to ensure there will be forests available for the next generation. Some of the numerous components include:

(1) the practice of proper planting, growing, and harvesting of trees while not jeopardizing the associated soil, air, water, wildlife, and aesthetics; (2) education of the private non-industrial landowners who own 74% of the state's forests; (3) ensuring forests are protected from pests, diseases, exotic plants, and human development; and (4) to continue to improve on all of the afore mentioned aspects of the forest industry. It is critical to continue sustainable forestry activities throughout the state to ensure an adequate supply of forest products for the human population that continues to grow at an alarming rate.

Best Management Practices (BMPs) are voluntary forestry practices implemented to minimize and prevent non-point source pollution. BMPs have existed since the late 1970's but began receiving more emphasis in the early 1990's. Overall harvesting compliance with BMPs in 2006 was 98%. Of the major BMP categories, compliance was highest for road BMPs (98.5%), followed closely by harvesting BMPs (97.5%) and stream side management zones (96.2%). Compliance was lowest for road stream crossings (92.3%), however, it is worthy to note that this is a significant increase from 77.8% in the previous survey (Sabin 2006).

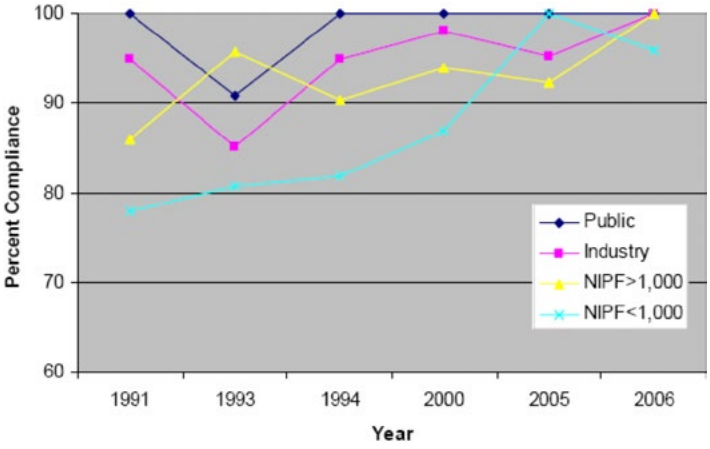
Figure 1. BMP Compliance Trends, By Category



Timber harvesting when BMPs are not utilized can cause overall habitat degradation and decrease environmental parameters associated with the harvested area. These include but are not limited to: soil erosion, sedimentation, water quality problems, rutting, poor placement of logging decks, loss of wildlife habitat, and clogging of streams with woody debris. In order to control and minimize these problems, a set of guidelines was developed for loggers as well and landowners to follow.

The 2006 survey also indicated that landowner compliance with BMPs varied as follows: public property = 100%, industrial property = 100%, non-industrial owned private property greater than 1000 acres = 100%, and non-industrial owned private property less than 1000 acres = 94%. When surveyed, only 44.6% of landowners with less than 1000 acres were familiar with BMPs and only 83.5% of all landowners required BMP compliance as part of that contract (Sabin, 2006).

Figure 2. BMP Compliance Trends, By Ownership



There are several programs that offer incentives for landowners to keep areas forested. They include but are not limited to the Environmental Quality Incentives Program, Conservation Reserve Program, and the Forest Renewal Program. However, these programs need additional funding to meet their reforestation and environmental goals. The South Carolina Forestry Commission, Clemson Cooperative Extension Service, consulting foresters, and industrial foresters offer expertise in proper forest management. Numerous pamphlets have been produced for the landowner that explain the BMPs and why they are important. However, many landowners still do not know the forestry services and incentives that are available to them. Thus, a significant portion of them do not realize how important and necessary BMPs are to the environment. Partners intend to continue expanding educational and outreach opportunities to reach these landowners.

C. Water Quality and Quantity

South Carolina's average streamflow is about 33 billion gallons per day. This water, coupled with surface reservoirs and underground aquifers must be managed to ensure adequate water for the future. Both surface and ground water availability correlate with the general physiology and geology of the state. Streams in the Foothills, Central Piedmont, and Western Piedmont Forest Legacy Areas tend to have well sustained base flows with only moderate variability; however, streams in the Northern and Southern Coastal Forest Legacy Areas generally have poorly

sustained base flows and are highly variable.

Ninety-six percent of the State's water needs are supplied by surface waters. South Carolina river corridors provide 1,311 river miles for water supply which represents 12% of the total miles of rivers in the state (Map 6). In 1980, gross water withdrawals in South Carolina were estimated to be 5,780 million gallons per day (mgd), representing a 96% increase during the past decade (South Carolina Water Resources Commission, 1983). About 7.6% of this water is consumed and not returned to available supplies.

Statewide gross water use is projected to increase 48% to 8,550 million gallons per day by the year 2020 (South Carolina Water Resources Commission, 1983). In 1980, 206 mgd of ground water and 5,570 mgd of surface were used throughout the state. In contrast, the projected use for the year 2020 is 484 mgd of ground water and 8,060 mgd of surface water (South Carolina Water Resources Commission, 1983). To further compound this issue, South Carolina is involved with intense negotiations with Georgia and North Carolina regarding surface water withdrawal and discharge into the rivers to ensure the wise use and sharing of this vital resource.

During most sampling periods, an estimated 84% of the state's major river miles meet Federal water quality goals, and 86% meet State water quality standards. Water quality problems include fecal coliform bacteria contamination, low dissolved oxygen concentrations, high suspended solid levels, and elevated nutrient levels. Large quantities of sediment enter the state's streams each year. This sedimentation impairs municipal, industrial, and recreational water use; destroys aquatic habitat; and adversely impacts desired aquatic organisms. Over 18 million tons of soils are eroded each year in South Carolina and contribute to the sedimentation problem (South Carolina Water Resources Commission, 1983). Forest lands that comprise over 90% of the nonfederal acres in South Carolina contribute only about 4% of total soil erosion (Assessment of Non-point Source Pollution for the State of South Carolina, 1989). Non-point source pollution contributors include agricultural runoff (67%), urban runoff (43%), construction (14%), abandoned gravel, sand, and clay mines (6%), silviculture (4%), and other categories (6.2%). The total percentage exceeds 100% because several of the identified waterbodies had more than one non-point source category contributing to the problem (SC Department of Health and Environmental Control, 1989). Most of the erosion in the state occurs in the Central and Western Piedmont Forest Legacy areas. Best management practices, which are primarily voluntary, have been developed to mitigate erosion.

Modification of watershed lands for various uses can significantly contribute to non-point source pollution. Forests that are located throughout these watersheds play an important role in decreasing sedimentation and improving water quality throughout the state.

Map 6. South Carolina Waterways

D. Conserving the Forest Land Base

South Carolina recently received draft data from the Southern Forest Land Assessment (Map7) which will provide a tremendous resource for conserving forest land in the state. The Southern Forest Land Assessment (SFLA) is a cooperative project of the Southern Group of State Foresters to spatially identify important forest lands in the 13 southern states and Puerto Rico. The project was funded by a Forest Stewardship Program grant from the USDA Forest Service and will use thirteen GIS data layers to map locations of important private forest lands. Other project outputs will include regional and state maps defining areas with significant forest resource threats and forest resource richness.

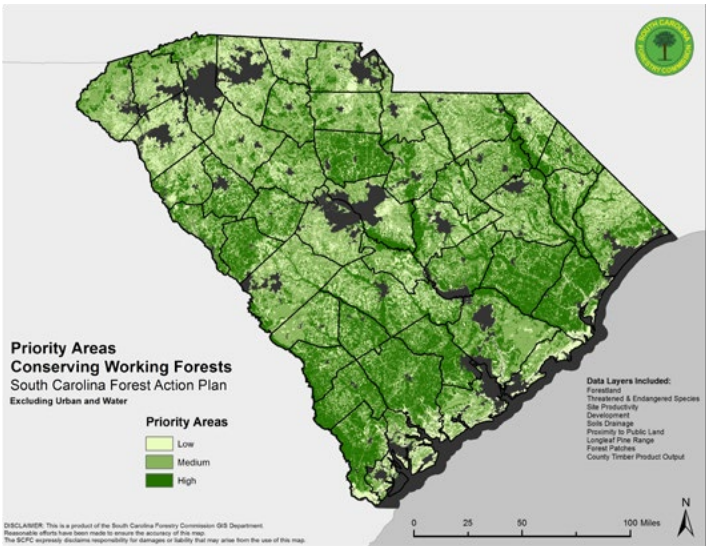
With the ever increasing population in South Carolina, urban areas are continuing to sprawl uncontrollably into the rural areas. Many counties in the state have very little or no zoning and have not even begun to plan for development. The state is already beginning to see a net loss of rural settings, rural land use, and their associated by-products. Conservation partners have begun to work with counties and local communities to address planning and conservation; however, this is a very long process and requires considerable time and money. Partners simply lack

the resources to produce quality plans and stay ahead of the development curve.

In addition, the number of housing units in South Carolina increased by 35.4% between 1990 and 2005. This well exceeded the national average of 21.8% during the same time period (Ulbrich and London, 2008). Much of this increase is a result of vacation and second homes. The urban areas are expanding and continuing to acquire more land to accommodate the building demands. Along with these houses come infra-structure, development, stores, malls, and other facilities. The price of forested land has now become expensive due to the demand for retailers to build and supply the necessary goods needed by the public.

One of the biggest threats from development is the indirect or secondary impacts to neighboring areas. Once development occurs near a forest, the management capabilities become threatened. For example, managers may no longer be able to prescribe burn the forest to enhance the growth of certain forest plants. With increasing development, sensitive animal species may be driven from their secluded habitats, noise pollution, as well as air pollution, and non-point source increase plus wildlife related activities such as hunting may be excluded due to the close proximity of an urban population, and the list continues. The end result is one forest may have been lost to the development itself, but another adjacent forest was impacted due to the inability to manage it properly. Conservation partners are working diligently to create conserved corridors of land to ensure the continuation of traditional forest management activities. The Forest Legacy Program plays an instrumental role in helping to curtail the loss of prime forest land and in the future ability to manage such forest land. Inclusion of land in the Forest Legacy Program will ensure working forests for generations to come and help the state in creating corridors of conserved forest lands.

Map 7. Conserve Working Forests



E. Prescribed Burning and Smoke Management

Prescribed burning has long been used as a preferred timber and wildlife management technique. In addition to reducing the risk of wildfire, prescribed burning helps to control hardwood competition within pine stands and stimulates early successional vegetation that is used by wildlife for food and cover. Unfortunately, fragmentation of forests and increasing development have caused an increase in smoke management concerns and threatened this cost-effective technique. If the ability to conduct prescribed burns is lost, numerous ecosystems and wildlife species will be at risk. One of the most significant ways to ensure the continuation of prescribed burning is to protect large blocks of forest land from development and fragmentation. The Forest Legacy Program can play a critical role toward ensuring the future of prescribed burning.

IV. Existing Programs To Protect Lands In South Carolina

A wide variety of programs are available to assist landowners in South Carolina in the proper management of their properties. They include but are not limited to the following:

Forest Stewardship Program: The Forest Stewardship Program (FSP) is a federally funded program administered by the South Carolina Forestry Commission. Landowners are furnished with a written management plan prepared by a team of natural resource professionals and tailored to fit the landowner's objectives for the property. Objectives include wildlife, timber, recreation, soil and water conservation, and aesthetics. All landowners who own at least 10 acres with at least 5 acres of woodland are eligible for FSP. There is no upper limit on acreage.

Forestry Renewal Program: The Forest Renewal Program (FRP) is a state program, administered by the Forestry Commission and funded by a tax on roundwood processed by forest industry and state appropriated funds. The FRP assists landowners with establishing timber production on their property.

Southern Pine Beetle Prevention and Restoration Program: The Southern Pine Beetle cost-share program

makes cost-share funds available to landowners for approved forest management practices that minimize future outbreaks and restore productive stands previously impacted by SPB infestations. Prevention practices include pre-commercial thinning to reduce the number of stems and basal area per acre in over-stocked pine stands. Restoration practices include returning damaged areas back to healthy forests by creating stands less susceptible to future SPB infestations. This is accomplished by planting loblolly at lower densities or planting species more resistant to SPB such as longleaf or hardwoods.

Conservation Reserve Program: The Conservation Reserve Program (CRP) offers landowners incentives to conserve soil, water, and wildlife habitat. Landowners can apply to enroll highly erodible land and other environmentally sensitive areas in the CRP. By enrolling land, a landowner can receive annual rental payments and cost-share benefits to implement conservation practices. Permanent vegetation which may include trees, grasses, or wildlife foods must be maintained for the contract period.

Wetlands Reserve Program: The Wetlands Reserve Program (WRP) is designed to help eligible landowners restore wetlands. Under this program, landowners enter into permanent easements, 30-year easements, or 10-year wetlands restoration agreements in exchange for a portion of restoration costs. The landowner maintains full control over access and use of WRP easement lands. Acceptable uses of WRP land may include activities such as hunting, fishing, and other compatible uses. The primary objective is to restore altered wetlands as closely as possible to the natural hydrology, native vegetation, and natural topography, protecting the functions and values of wetlands in the agricultural landscape.

Wildlife Habitat Incentives Program: The Wildlife Habitat Incentives Program (WHIP) was established by the 1996 Farm Bill for the purpose of making technical and financial assistance available to landowners to develop, enhance, and restore upland wildlife, wetland wildlife, threatened and endangered species, fish, and other types of wildlife habitat. In South Carolina, WHIP is specifically targeted towards developing, restoring, and enhancing habitat for the following "priority species":
- Bobwhite quail and associated grassland/shrub songbirds
- Wintering waterfowl and shorebirds
- Threatened, endangered, and species of state concern.

Environmental Quality Incentives Program: The Environmental Quality Incentives Program (EQIP) is designed to identify conservation concerns and set conservation priorities to address soil erosion, water quality, wildlife habitat, and other resource issues through a community-based process. EQIP is available in all 46 counties to address statewide resource concerns. Sixty-five percent of EQIP funds are targeted towards approved Conservation Priority Areas. State Conservation Priority Areas have been identified by local work groups, ranked by the State Technical Committee, and submitted to Washington for approval. Practices such as field borders, filter strips, and grassed waterways designed to protect water quality may also be maintained as early successional habitats to benefit bobwhite quail and other species. Riparian (streamside) buffer zones used to protect streams from runoff can also be highly productive areas for wildlife, providing food, cover, and travel corridors.

Farm and Ranchland Protection Program: The Farm and Ranch Lands Protection Program (FRPP) provides matching funds to help purchase development rights to keep productive farm and ranchland in agricultural uses. By working through existing programs, NRCS partners with state, tribal or local governments and non-governmental non-profit organizations to acquire conservation easements or development rights on prime, unique or other productive farmland. The program also provides assistance for farms containing significant historical or archaeological resources. NRCS provides up to 50 percent of the fair market easement value.
To qualify, farmland must: be part of a pending offer from a state, tribe, or local farmland protection program; be privately owned; have a conservation plan for highly erodible land; be large enough to sustain agricultural production; be accessible to markets for what the land produces; have adequate infrastructure and agricultural support services; and have surrounding parcels of land that can support long-term agricultural production. Depending on funding availability, proposals must be submitted by the eligible entities to the appropriate NRCS State Office during the application window.

Grassland Reserve Program: The Grassland Reserve Program (GRP) is a voluntary program offering landowners the opportunity to protect, restore and enhance grasslands on their property. Section 2401 of the Farm Security and Rural Investment Act of 2002 (Pub. L. 107-171)

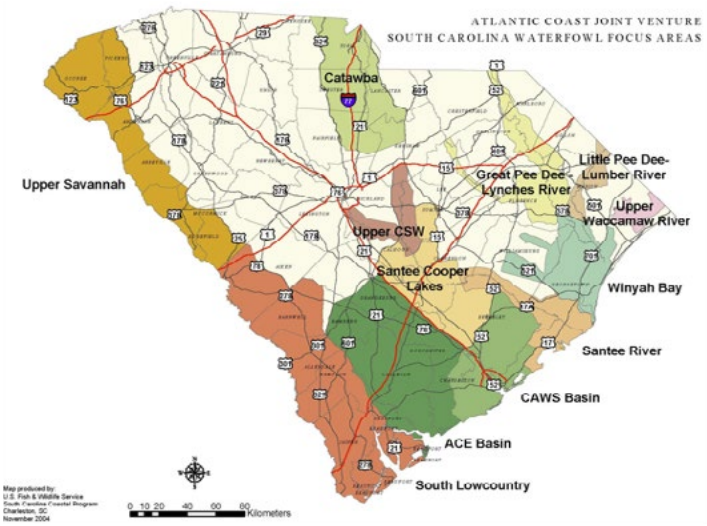
amended the Food Security Act of 1985 to authorize this program. The Natural Resources Conservation Service (NRCS), Farm Service Agency (FSA) and the U. S. Forest Service are coordinating implementation of GRP, which helps landowners restore and protect grassland, rangeland, pastureland, shrubland and certain other lands and provides assistance for rehabilitating grasslands. The program will conserve vulnerable grasslands from conversion to cropland or other uses and conserve valuable grasslands by helping maintain viable grazing operations.

Focus Area Initiative: The Forest Legacy Program's (FLP) objectives are very similar to the Focus Area Initiative in South Carolina. Focus Areas are local grass-roots projects working within the framework of the Atlantic Coast Joint Venture of the North American Waterfowl Management Plan (NAWMP). The NAWMP recognizes the loss of wetland habitats and recommends that wetland habitat and associated uplands be protected through conservation easements and land acquisition.

In South Carolina, there are twelve Focus Areas (Map 8) that typically comprise major waterways and river systems. The majority of the Focus Area's success has come within the coastal areas which contain numerous wetland acreages. Larger plantations, that contain substantial wetland acreages, have been the major donor of conservation easements. This effort has seen much success along the coast; however, easement donation is very limited in the inland areas of the state. These Focus Area Initiatives were the original guiding factor in the design of the Forest Legacy Areas.

The Focus Area Initiative in South Carolina has done well in promoting conservation easements since 1987, but forest land and wildlife habitat are being lost to development at a faster rate than the land is being protected. As part of the Focus Area Initiative, conservation easements are donated to private organizations or funded through a grant from the SC Conservation Bank. Conservation Bank funds are extremely competitive, so grants must be highly leveraged and not all applications will be funded. In an effort to prevent competition with the nonprofit organizations and prevent duplication of effort, grants received from the FLP will primarily be used for land acquisition. The FLP and the Focus Area Initiative complement each other very well and allow SCDNR to target major acquisitions that could leverage donated conservation easements for the Focus Areas.

Map 8. South Carolina Waterfowl Focus Areas



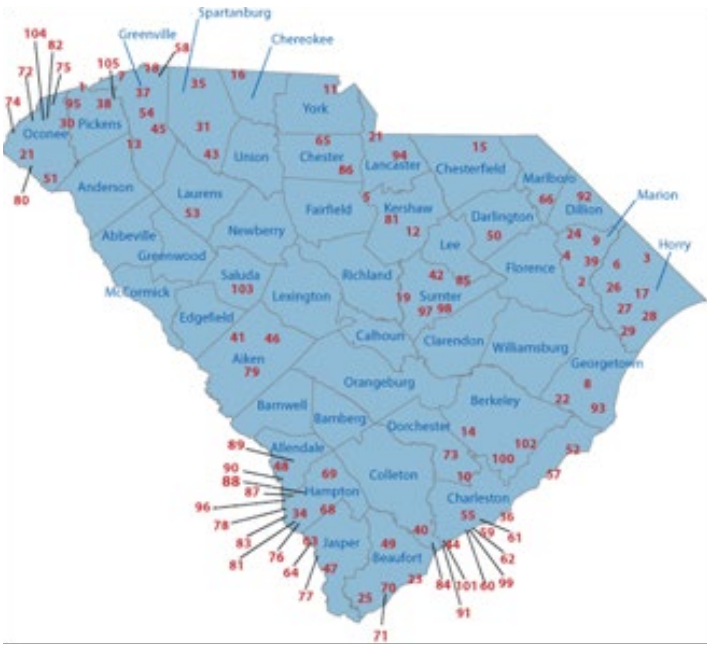
South Carolina Conservation Bank: The mission of the SC Conservation Bank is to improve the quality of life in South Carolina through the conservation of significant natural resource lands, wetlands, historical properties, and archeological sites. Its primary objectives are to:

- Protect significant natural resource areas and wildlife habitats
- Protect water quality
- Maintain the state's forest lands
- Protect farmlands, especially family farms
- Protect and enhance the state's natural beauty
- Protect and enhance significant historical and archaeological sites
- Enhance public access for outdoor recreation and preserve traditional uses such as hunting, fishing, and other types of outdoor recreation
- Encourage cooperation and innovative partnerships among landowners, state agencies, municipalities, and non-profit organizations.

The Conservation Bank makes grants to government agencies and nonprofit organizations to protect such areas through fee-simple acquisition or conservation easements. SCDNR has a very successful history of leveraging Forest Legacy funds with grants from the Conservation Bank to protect large blocks of forestland in South Carolina.

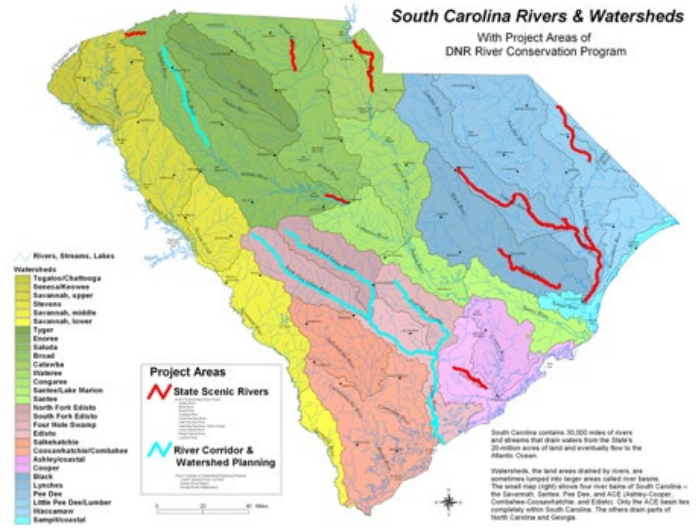
Scenic Rivers Program: The goal of the Scenic Rivers program is the conservation of SC's river heritage through proper management of the natural and cultural character of the state's river corridors. As is stated in the South Carolina Scenic Rivers Act of 1989,this program has the purpose of protecting "unique or outstanding scenic, recreational, geologic, botanical, fish, wildlife, historic,

Map 9. South Carolina Conservation Bank Projects



or cultural values" of selected rivers or river segments in the state. This program utilizes a community-based planning approach that works with riparian landowners and other community interests to write and implement a river corridor management plan. As with other previously described programs, landowner participation is entirely voluntary. To date, portions of ten rivers have been designated as South Carolina Scenic Rivers (Map 10).

Map 10. South Carolina Rivers and Watersheds



V. Land Trusts in South Carolina

South Carolina has one of the most successful land trust programs in the United States. Land trusts are non-profit organizations that are dedicated to the preservation and protection of land through acquisition of land and interests in land. Land trusts have also played a major role in assisting with the donations of conservation easements to meet the South Carolina Focus Area goals. Currently, there are 26 Land Trusts in South Carolina with the primary goal of protecting undeveloped land.

- Aiken County Open Land Trust
- Beaufort County Open Land Trust
- Black Creek Land Trust
- Community Open Land Trust
- Congaree Land Trust
- Edisto Island Open Land Trust
- Katawba Valley Land Trust
- Kiawah Island Natural Habitat Conservancy
- Lord Berkeley Conservation Trust
- Lowcountry Open Land Trust
- Mount Pleasant Open Space Foundation
- Nation Ford Land Trust
- Naturaland Trust
- Pacolet Area Conservancy
- Palmetto Conservation Foundation
- Pee Dee Land Trust
- Friends of the Reedy River Land Trust
- South Carolina Battleground Preservation Trust
- Spartanburg Conservation Endowment
- The Conservation Fund
- The Nature Conservancy
- Wetlands America Trust (Ducks Unlimited)
- Upper Savannah Land Trust
- Upstate Forever
- Waccamaw Land Trust
- Trust for Public Land

Goals For The Forest Legacy Program In South Carolina

- Identify and protect environmentally important forest lands threatened with conversion to non-forest uses;
- Protect river systems, wetlands, and their associated upland habitats;
- Increase the opportunity for public recreation;
- Reduce forest fragmentation caused by development;
- Provide environmental benefits through the restoration and protection of riparian zones, native forest plants and animals, and remnant forest types;
- Provide for watershed and water supply protection;
- Provide employment opportunities and economic stability through maintenance of traditional forest uses;
- Maintain important scenic resources of the state;

- Protect rare, threatened, or endangered species of plants and animals;
- Promote Forest Stewardship;
- Promote Best Management Practices for forestry;
- Provide for educational and research opportunities;
- Provide buffer areas and connectivity to already protected areas;
- Enhance forest diversity.

Eligibility Criteria For Forest Legacy Areas

To be eligible as a South Carolina Forest Legacy Area forested land must meet all of the following criteria:

- Be threatened by present or future conversion to non-forest uses;
- Be threatened with conversion by encroaching development or be subject to division into small non-contiguous forest tracts, separated by non-forest land;
- Contain one or more of the following important public values:
  - –scenic resources;
  - –public recreation opportunities;
  - –rivers, streams, or lakes recognized as important to the state;
  - –wetlands, riparian areas, or floodplains;
  - –important public water supplies;
  - –habitat for forest-dependent birds (resident and migratory species), mammals, reptiles, amphibians, invertebrates, and fish;
  - –habitat for rare, threatened, and endangered plant or animal species;
  - –important cultural resources;
  - –large blocks of contiguous forest land.
- Provide opportunities for continuation of traditional forest uses (forest management, watershed protection, and recreational activities such as bird watching, hiking, hunting, and fishing);
- Reflect important regional values.

The Forest Legacy Acquisition Process In South Carolina

Tract Identification And Prioritization

Landowners interested in participating in the Forest Legacy Program may contact the South Carolina Department of Natural Resources (SCDNR) or the South Carolina Forestry Commission (SCFC). All applications and tract information will be collected and maintained by the Forest Legacy Coordinator with the SCDNR. The SCDNR will maintain close communication with representatives from the SCFC regarding the FLP. Since the primary focus of the FLP in SC is to conduct fee-simple title to tracts, most of the potential acquisitions will likely be with corporate landowners and not individual citizens. The FLP coordinator will have the discretion of determining what paperwork and documentation is necessary for review by the Forest Legacy Subcommittee. If an individual landowner wishes to have a small tract considered for a conservation easement, forms are available in Appendix C. Potential tracts for FLP funding will be discussed by the Forest Legacy Subcommittee. The Forest Legacy Subcommittee will evaluate the proposed properties with the eligibility and the evaluation criteria in Appendix C.

The Forest Legacy Program will be used to acquire forested lands that are threatened with conversion to non-forest uses. Special consideration and priority will also be given to tracts designated as significant or high priority by the:

- Southern Forest Land Assessment
- Focus Area Initiative and/or
- Other collaborative landscape conservation partnerships in South Carolina.

Priority will be also given to tracts that adjoin already conserved properties, promote significant leverage from other funding sources, are located along or buffer river systems, and provide multi-faceted resource benefits.

The Forest Legacy Subcommittee has the option to purchase a conservation easement or to pursue a fee simple purchase. Lands will only be acquired on a willing buyer-willing seller basis. Fee simple purchases are the preferred means of acquisition. Conservation easements will only be purchased under specific circumstances including but not limited to the following:

- The possibility of a fee simple purchase is not available.
- The property offers considerable public recreation benefits.
- The property offers considerable benefits to the conservation of neighboring properties.

All members of the Forest Stewardship Coordinating Committee will not be involved in the decision process. Instead, a diverse group of representatives from the Forest Stewardship Coordinating Committee have been assigned to serve on the Forest Legacy Subcommittee. These representatives will provide the input for the Forest Stewardship Coordinating Committee.

The Forest Legacy Subcommittee will rank the available properties and make recommendations to the SCDNR and SCFC. Since Forest Legacy funding is limited and rarely provides enough funding to complete an acquisition, SCDNR and the SCFC will discuss recommendations from the committee and make the final decision for identifying submissions for the Forest Legacy Program.

Due to a long history and previous working relationships, no disagreements or problems should arise with this strategy. Once specific properties are identified, the tract will be established as an acquisition project, and an appraisal and a level one environmental assessment will be contracted. It will then be submitted to the State Budget and Control Board for final approval and follow state procurement procedures and FLP guidelines.

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APPENDIX A

Completed Forest Legacy Projects

Project/Tract Name	Date Funded	Date Completed	Acres	CE/Fee	FLP Contribution
Catawba River	02/16/05	06/29/07	1,540	Fee	$ 2,958,000
Landsford Canal	02/11/02	05/06/02	1,049	Fee	$ 2,960,000
Tuomey	05/07/03	09/24/04	3,270	Fee	$ 4,503,000
Santee	10/01/01	11/18/03	12,349	Fee	$ 2,850,000
Beech Hill	05/15/01	01/28/02	1,369	Fee	$ 1,592,167
Edisto WMA	05/14/01	01/28/02	5,752	CE	$ 4,050,000
Geddis	05/15/01	09/15/04	25	Fee	$ 64,000
Mead Easement	05/26/04	12/15/04	6,326	CE	$ 6,795,300
Woodbury	02/15/07	07/13/07	25,668	Fee	$ 3,306,754
Hamilton Ridge	02/15/07	04/26/07	13,281	Fee	$ 1,693,246
Shooting Tree	02/14/00	12/07/00	571	Fee	$ 975,000
South Carolina Total			**71,200**		**$ 31,747,467**

APPENDIX B

Forest Legacy Area Descriptions

Foothills

The Foothills Forest Legacy Area (FFLA) is comprised of portions of Anderson, Oconee, and Pickens Counties and is located in the northwestern corner of the state. The area is primarily mountain, foothill, and piedmont type terrain. Elevations vary from 475 feet at the high water mark on Lake Russell to 3,554 feet at the top of Sassafras Mountain, the highest point in South Carolina. Major lakes in the area include Lake Jocassee, Lake Cunningham, Lake Robinson, Lake Hartwell, Lake Keowee, Lake Russell and Tugaloo Lake. Major river systems include the Chauga, Chattooga, Keowee, Enoree, and Saluda. This forest legacy area contains the Upper Savannah Focus Area and adjoins the Andrew Pickens Ranger District of the Sumter National Forest.

Special Values of the Forest Land in the Area:

Forest types range from extensive pine plantations in many of the piedmont sections of the area to mountain ecosystems in Oconee, and Pickens Counties. While most of the piedmont forest are in private ownership much of the mountainous land is owned by local municipalities and state and federal agencies. The northern forest is primarily managed for hardwoods, and the southern forest is primarily managed pine. The mountain ecosystems are one of the most unique natural resource areas east of the Mississippi. The mountains ecosystems' substantial stands of hardwood and pine-hardwood forest, contribute to its significant ecological, scenic and recreational attributes. This area has over 120 miles of quality trout streams supporting naturally reproducing populations of brown, rainbow, and the unique strain of Southern Appalachian brook trout. The area also provides essential habitat for the region's black bear and grouse populations. Because of its size and position on the Blue Ridge Escarpment, the mountain area provides important habitat for neo-tropical migratory songbirds considered by ornithologists to be species of concern.

In addition to being important breeding habitat, Clemson University researchers have documented that extensive mountain habitat is critically important to all bird migrants in the area. During 1997, more bird migrants came through the Jocassee area than any other place in South Carolina (Clemson University radar work).

The FFLA has many state listed rare, threatened or endangered plant and animal species. The area has a rich cultural heritage. Native American sites and folklore are abundant, as well as sites used by early settlers.

Current Conversion Pressures:

The decline in number of acres of Wildlife Management Areas has escalated rapidly over the past few years. Over 20,000 acres of WMA have been removed in the past decade. These were primarily lands that will be developed into residential communities. Lands around Lakes Keowee and Hartwell are developing rapidly into upscale housing and gated communities. Thousands of acres of mountain land have been sold to developers for golf course communities. Urban expansion, second homes and rural subdivisions have greatly decreased the amount of land available for forest management.

Greenville County continues to maintain the highest population of any county in South Carolina and in 2007 was rated as the fifth fastest growing county in the state (Population Division, US Census Bureau). Given the developed nature of this county, forested areas within the neighboring counties of this Forest Legacy Area are vital to the Upstate, especially as citizens who work in Greenville are seeking more rural landscapes in which to live and are willing to commute long distances. This trend is mirrored throughout the FFLA. These statistics clearly indicate that people are moving from metropolitan to rural areas.

There is a trend on public lands to minimize forestry activities at the expense of species which require forest management. Recently, several environmental groups asked the USFS to refrain from any timber management on their lands. Currently, approximately thirty percent of the Andrew Pickens District is already in areas zoned for no timber management. With the decreasing management of private lands because of urban encroachment and other before mentioned activities it is becoming increasingly important that public forested lands be managed. Because of lack of managed lands, hunting opportunities and hunter enthusiasm has already begun to decrease.

Potential Future Conversion Factors:

All parts of the FFLA are experiencing significant growth. Future housing developments are being planned throughout the FFLA. The purchase and protection of the Jocassee Gorges Property has increased the interest of persons to move into this area. The Southern Connector Highway in southern Greenville County will further enhance development of industry and will further erode good wildlife habitat.

Goals and Objectives for FFLA:

- Encourage habitat enhancement through land purchase and sound forest management
- Protect important historic and archeological sites
- Maintain and enhance all significant forest types and their associated plant and animal communities
- Increase public recreation opportunities
- Protect scenic landscapes in the area; particularly along a designated scenic road or river.
- Protect areas designated as part of the Upper Savannah Focus Area Initiative or Partnership for the Blue Ridge.
- Protect river systems, wetlands, and their associated upland habitats.
- Provide a connective corridor between existing conservation projects.

Central Piedmont

The Central Piedmont Forest Legacy Area (CPFLA) encompasses counties within the Piedmont Plateau Region of South Carolina. The CPFLA includes portions of Chester, Fairfield, Lancaster, Laurens, Newberry, Union, and York Counties. This area contains the Catawba Focus Area. The topography consists of moderate to steeply sloped drainages characteristic of the Piedmont Plateau, and soils are generally acidic with a sandy-loam topsoil and a red clay subsoil.

Special Values of the Forest Land in this Area:

Forest types range from extensive bottom-land hardwoods along the Broad River, Tyger River, Enoree River and the Catawba River basins, with loblolly and shortleaf pines in the Piedmont, to limited upland hardwood forests in portions of the area.

Production of forest products is a major industry in the area. Commercial wood using industries produce lumber, plywood, oriented strand board, chips for paper and pulp, posts, and fuel. Forest related activities, such as hunting and outdoor recreation are also very significant opportunities which contribute greatly to the well being and livelihood of the local communities and their economies.

These forests provide many unique habitats that are used by a variety of wildlife, some of which are endangered or threatened. In addition to many endangered or threatened plant species found in these forests, this area is home to many endangered or threatened animal species such as the Bald Eagle, wood stork and Schweinitz's sunflower . The area also has a rich cultural heritage, both historic and prehistoric. Native American sites abound (particularly around the river basins), as well as sites used by early settlers. Several of these areas have already been protected

under the state Heritage Preserve program (Rock Hill Blackjacks HP, Pacolet River HP and Peters Creek HP) or as part of state parks (e.g. Landsford Canal SP, Rose Hill State Historic Site, Chester SP, Croft State Natural Area and Musgrove Mill SP) and national historic sites (Kings Mtn. National Battlefield and Cowpens National Battlefield).

Managed Lands within the CPFLA:

Managed lands include those that are publicly and privately owned for the purpose of conserving and preserving natural resource values. These values include fish and wildlife habitat conservation, preservation of archaeological and historical sites and sustainable recreation areas. The SCDNR manages several properties within the CPFLA including but not limited to: Draper, Landsford Canal, Heritage Tract, McDowell Creek, and Forty-Acre Rock. These Wildlife Management Areas (WMA's) and Heritage Preserves (HP's) generally include upland habitat and most have significant frontage along creeks and/or major rivers.

These areas provide key opportunities for hunting, fishing, hiking, bird watching, and other non-consumptive uses. The Draper WMA is a flagship WMA within the CPFLA that promotes habitat development and maintenance for early plant successional stage communities that enhance the propagation of bobwhite quail and other wildlife species that benefit from these habitat types. The South Carolina Parks, Recreation and Tourism Department also managed property in and around the CPFLA. These areas include Andrew Jackson, Chester, Croft, Kings Mountain, Landsford Canal and Rose Hill State Parks. In most cases these parks are managed for daily visitation to inform visitors of significant historical events or places and have limited camping facilities.

Finally, the Enoree Ranger District of the Sumter National Forest adjoins this Forest Legacy Area. The Enoree is one of three ranger districts that comprise the Sumter National Forest. Its 161,216 acres are located in Chester, Fairfield, Laurens, Newberry and Union Counties.

Current Conversion Pressures:

Many of the counties within the CPFLA are experiencing dramatic conversions from timberlands to residential and commercial development. In fact, from 2006-2006 York County was the fastest growing county in South Carolina and ranked second in overall population (Population Division, US Census Bureau). Most of this growth can be attributed to the expansion of Charlotte, North Carolina and Rock Hill, South Carolina.

Potential Future Pressures:

This region has four interstates (I-26, I-77, I-385 and I-85) which make commuting by workers and transportation of business products very desirable. It is apparent that the continual growth and expansion of urban areas and the loss of rural forested areas, particularly along interstate corridors, will continue. The next decade will most likely see a much greater conversion of forested lands to urban sprawl than the last decade due to the attractiveness of the region to industrial development and its commutable proximity to major metropolitan areas.

Goals and Objectives for the CPFLA:

- Maintain and enhance the forests of the Piedmont Plateau and their associated plant and animal communities.
- Enhance the opportunities for public recreation.
- Protect the scenic landscapes within the area.
- Protect areas of historic and archaeological significance.
- Protect diminishing riparian corridors from further development; including the protection of river systems, wetlands, and their associated upland habitats.
- Protect areas designated as part of the Catawba Focus Area Initiative.
- Provide a connective corridor between existing conservation projects.

Western Piedmont

The Western Piedmont Forest Legacy Area (WPFLA) includes portions of Abbeville, Aiken, Edgefield, Greenwood, McCormick, and Saluda Counties. Terrain in the area is typical of the Piedmont and Sandhills, with gently to severely rolling elevations varying from about 80 to 850 feet above mean sea level. Two major river systems, the Savannah and the Saluda, drain the area. This area contains the portions of the Upper Savannah and South Lowcountry Focus Area Initiatives.

Special Values of the Forest Land in this Area:

Forest types range from extensive bottom-land hardwoods along the Savannah River, longleaf pine-wiregrass and scrub oak communities in the Sandhills, loblolly and shortleaf pines in the Sandhills and Piedmont, to limited upland hardwood forests in the upper portion of the area.

Production of forest products is a major industry in the area. Commercial wood using industries produce lumber, plywood, oriented strand board, chips for paper and pulp, posts, and fuel. Forest related activities, such as hunting and outdoor recreation are also important industries which contribute significant amounts of money to local economies.

These forests provide many unique habitats that are used by a variety of wildlife, some of which are endangered or threatened. In addition to many endangered or threatened plant species found in these forests, this area is home to many endangered or threatened animal species such as Webster's salamander and the gopher tortoise. The area also has a rich cultural heritage, both historic and prehistoric. Native American sites abound, as well as sites used by early settlers. Several of these areas have already been protected under the state Heritage Preserve program or as part of state parks and national historic sites.

Managed Lands within the WPFLA:
Managed lands include those lands that are owned primarily for the purpose of natural resources conservation, and may be publicly or privately owned. This area adjoins the Long Cane Ranger District of the Sumter National Forest (119,077 acres) and the Savannah River Site (198,000 acres) which is owned by the Department of Defense. SCDNR owns several properties including Aiken Gopher Tortoise Heritage Preserve and the Mason Wildlife Management Area.

Current Conversion Pressures:
All counties in the WPFLA are experiencing significant industrial growth especially Greenwood and Aiken Counties. Due to its proximity to Laurens County and Augusta, GA which both are major centers for manufacturing in textiles, pharmaceuticals, metals, and other products, this corridor is facing tremendous development pressure from commuters and second home sites. The Savannah River and Lake Greenwood provide highly sought after amenities for such developments. In addition, forest land in Aiken County is rapidly being cut and converted into small horse farms and thereby creating a dramatic rise in land value.

Potential Future Conversion Factors:
All parts of the WPFLA are experiencing significant growth, with a noticeable trend of locating residences in rural, rather than suburban areas. A number of new industries have located within the area, bringing additional people to the area. Developers have actively been seeking to acquire and develop lands around Lake Russell and Lake Thurmond (including lands owned by the Corps of Engineers). Interstate 20 traverses the area thereby creating easy access to nearby metropolitan areas. In addition, plans are underway to widen or four-lane a number of other highways, which will encourage subsequent development and loss of forests.

Goals and Objectives for the WPFLA:
- Maintain and enhance significant examples of all forest types in the Western Piedmont Forest Legacy Area and their associated high quality plant and animal communities.
- Protect riparian corridors and flood plains along the Savannah and Saluda rivers.
- Protect important historic and archeological sites.
- Maintain contiguous forest land by linking managed public and private lands.
- Encourage habitat enhancement through land purchase and sound forest management to increase public hunting and other outdoor recreation opportunities.
- Protect the scenic landscapes within the area.
- Protect areas designated as part of the Upper Savannah and South Lowcountry Focus Area Initiatives.
- Provide a connective corridor between existing conservation projects.

Northern Coastal

The Northern Coastal Forest Legacy Area (NCFLA) of South Carolina includes portions of Chesterfield, Darlington, Dillon, Florence, Lee, Marion, Marlboro, Horry, Sumter, Richland, Clarendon, Georgetown and Williamsburg Counties. This area contains the Great Pee Dee/Lynches, Little Pee Dee/Lumber, Upper Waccamaw, Santee River, Santee Cooper Lakes, Upper Congaree/ Wateree/Santee, and Winyah Bay Focus Area Initiatives.

Special Values of the Forest Land in this Area:
Within the NCFLA, many coastal plain forest ecosystems can be found. In the upper coastal plain region well developed xeric sandhills can be found in Kershaw and Chesterfield Counties. These forests are dominated by longleaf pine and turkey oak. Moving eastward deep sandy soils are less prevalent and tree species diversity increases. Most stands on upland sites are dominated by loblolly and/ or longleaf pine with the understory consisting of a variety of hardwood shrub species.

There are however, some very unique ecosystems just east of the Sandhills. In Lee County there are forests that are classified as Longleaf Pine Savannas. These savannas are critical for the existence of several rare and threatened plants and animals in Lee County.

The Great Pee Dee River is the ecological cornerstone of the Northern Coastal Plain. This large red river enters South Carolina from North Carolina and travels south to Winyah Bay in Georgetown County. The Great Pee Dee is the only large red river in South Carolina that has not been dammed, so a considerable amount of diversity in forest lands still exists. The higher bluff portions are mostly mature oak-hickory forests with the lower elevations being comprised mainly of gum-cypress swamps. Currently, the Great Pee Dee river swamp represents the most significant forested land mass in the region. In addition to the Great Pee Dee, there are several black water streams in the region that have forested wetlands and uplands. These river systems are essential flood plain habitats that are important to many aquatic species and must be protected.

The coastal portion of this region contains many Carolina bays that have not been cleared for agriculture. Carolina Bays are elliptical shallow depressions found primarily in the Northern Lower Coastal Plain. They have many unique physical and botanical characteristics and usually differ markedly from local flora both in terms of plant structure and species composition. Carolina Bays provide tremendous diversity and are home to many threatened and endangered species.

Managed Lands Within the NCFLA:

Non-industrial private landowners still own the majority of the land in South Carolina's Northern Coastal FLA. Desirable agricultural characteristics have resulted in a very high percentage of the land base being converted to farmland. However, there is considerable forest land owned by non-industrial landowners. The most significant managed forest lands in the NCFLA are those owned by forest industry. Additionally, there are several forests owned by state agencies including the South Carolina Forestry Commission, South Carolina Parks Recreation and Tourism, South Carolina Public Service Authority, and the South Carolina Department of Natural Resources. Also there are two National Wildlife Refuges, and numerous tracts protected by non-profit organizations through either fee-simple ownership or conservation easements.

Current Conversion Pressures:

Currently some of the fastest population growth rates in the state are occurring in this region. From 2006-2007, Horry County was the third fastest growing county in the state. Much of Horry County has been developed, and the remaining undeveloped land is too expensive for conservation to be a feasible option. Within the last 10 years the coastal portion of Horry County has developed a reputation as a year-long resort area. Most notably the golf industry has soared. With this tremendous increase in year-round tourism has come a need for increased infrastructure. Conservation priorities have therefore been established for neighboring areas and counties to limit the spread of uncontrolled development.

Potential Future Conversion Factors:

Historically, most development has occurred close to the coast. However, within the last 5 years, significant development has occurred inland. There is every reason to believe that growth will continue to spread westward, especially as the construction of Interstate-73 begins. In addition to the growing threat from the tourism industry, legislators from some rural counties have introduced bills to relax tax rates for large industries. If these efforts are successful and new industries locate in this area, the value of land will increase. As demand for land increases, so will the economic incentives for private landowners and industrial forest landowners to sell tracts for development. This FLA recently saw major changes in ownership as International Paper decided to divest of all its land holdings. Fortunately, many of the large tracts were purchased by other timber investment organizations; however, these companies are still in the process of identifying which tracts they wish to retain and which ones are going to be sold. The future of these traditional industrial forests is still very uncertain.

Goals and Objectives for NCFLA:

- Strategically protect lands to provide significant greenways along the river systems.
- Protect, maintain and enhance significant forested areas.
- Increase public recreation opportunities.
- Protect important cultural and archaeological sites.
- Protect the scenic landscapes within the area.
- Protect diminishing riparian corridors from further development; including the protection of river systems, wetlands, and their associated upland habitats.

- Protect areas designated as part of the Great Pee Dee/ Lynches, Little Pee Dee/Lumber, Upper Waccamaw, Santee River, Santee Cooper Lakes, Upper Congaree/ Wateree/Santee, and Winyah Bay Focus Area Initiatives.
- Provide a connective corridor between existing conservation projects.

Southern Coastal

The Southern Coastal Forest Legacy Area (SCFLA) encompasses much of the southeastern third of the state. The SCFLA contains portions of Allendale, Bamberg, Barnwell, Beaufort, Berkeley, Calhoun, Charleston, Colleton, Dorchester, Hampton, Jasper, and Orangeburg Counties. There are many low/wet areas with rivers flowing into the Savannah River, Edisto River or the Atlantic Ocean. This area contains four focus areas (Santee River, CAWS Basin, ACE Basin, and South Lowcountry and the Santee Cooper Lakes Focus Area Initiatives.

Special Values of Forest Land in this Area:

Historically, longleaf pine dominated the uplands, and bottomland hardwoods including oaks, bald cypress, and water tupelo dominated the low/wet areas. The abundant low-lying areas along with productive uplands make this area and the forest within it diversified and valuable.

The forest industry is a thriving part of the economy for these counties and creates a large majority of the workforce needs for the area. Forest industry and the overall local economies rely heavily on the forest in this area and the assurance of these forests for years to come. In addition to money generated from the management and harvesting of the forests, is the contribution to the local economies for hunting leases and other recreational opportunities such as camping, walking, bike-riding, fishing, and boating. This portion of the state maintains the longest hunting season on any state in the nation and counties receive direct financial benefits from travel and expenditures associated with these activities.

The SCFLA contains many threatened and endangered species including but not limited to the: gopher tortoise, wood stork, red-cockaded woodpecker, Canby's dropwort, and pondberry.

Managed lands within SCFLA:

Managed lands include those lands that are publicly or privately owned for the purpose of natural resource conservation. The SCFLA contains and adjoins many state and federally owned properties such as wildlife management areas, heritage preserves, state parks, research reserves, military bases, and wildlife refuges. In addition, a tremendous amount of land that is protected within SCFLA by voluntary conservation easements. The Francis Marion National Forest (252,201), administered by the USDA, Forest Service, also adjoins this FLA.

Current Conversion Pressures:

Five counties in this area are growing at an equal or faster rate than the state average of 7.3%, between 1990 and 1995 (Dorchester 21%, Beaufort 19.9%, Berkeley 18.4%, Jasper 8.5%, and Colleton 7.3%). Major cities within these counties are also expanding at a fast rate. The expansion of these counties and cities indicates the conversion of rural land into urban area and along with other uses that are non-conducive to natural forests.

Potential Future Conversion Factors:

Cities are annexing property on all sides to allow for the expanded growth in population and the accompanying development. Large industries are locating along major river systems, especially those near ports. Charleston, South Carolina already contains the largest containerized port in the Southeast Atlantic and Gulf Coasts. A proposed interstate (I-73), that will bisect numerous rural areas, may run from West Virginia to Charleston, South Carolina. Along with this will come industries, commercial development, and residential development. The major island resorts are also expanding to accommodate the growing numbers of tourists that are relocating and visiting the coastal areas.

Goals and Objectives for SCFLA:

- Maintain and enhance the high quality of forest resources along with the associated plant, and animal communities.
- Maintain and enhance the bottomland hardwood areas located along major river systems.
- Protect historical and cultural resources.
- Protect areas inhabited by threatened and endangered species.
- Maintain contiguous forest land by connecting to managed public and private lands.
- Preserve the rural landscape and associated by-products that provide jobs.
- Provide opportunities for the public to have a place to enjoy various types of outdoor recreation.

- Provide opportunities for environmental education and research.
- Protect the scenic landscapes.
- Protect diminishing riparian corridors from further development; including the protection of river systems, wetlands, and their associated upland habitats.
- Protect areas designated as part of the Santee River, CAWS Basin, ACE Basin, South Lowcountry, and Santee Cooper Lakes Focus Area Initiatives.
- Provide a connective corridor between existing conservation projects.

APPENDIX C

Application and evaluation forms

South Carolina Forest Legacy Landowner Application Package

Contents

FOR OFFICE USE ONLY

APPLICATION NUMBER:_____

DATE:_____

STATE OF SOUTH CAROLINA

FOREST LEGACY PROGRAM

LANDOWNER INSPECTION CONSENT AGREEMENT

I, _____as the landowner or the landowner's authorized agent (proof of authorization must accompany this document) agree to allow inspection, appraisal and survey of my property being offered for consideration under the Forest Legacy Program. I agree to allow members of the U.S. Forest Service, South Carolina Forestry Commission, South Carolina Forest Stewardship Coordinating Committee, the South Carolina Department of Natural Resources or their designated staff to inspect the property as may be required at any time. I shall be notified in advance of all inspection visits.

_____ _____

Signature of Landowner or Agent Date

_____ _____

SC Department of Natural Resources Date

_____

Title

FOR OFFICE USE ONLY

Received by:_____ Application Number_____

Date:_____

ACQUISITION TYPE: ____Fee Purchase ____Conservation Easement

APPLICANT INFORMATION:

Landowner's Name:_____

Mailing Address:_____

_____

Daytime Telephone Number:_____

Landowner's Agent:_____

Mailing Address:_____

_____

Daytime Telephone Number:_____

South Carolina House District:_____

South Carolina Senatorial District:_____

PROPERTY INFORMATION:

Legal Description: County:_____

Tax Map # _____

Assessor's Plat and Lot Numbers:_____

Deed Reference (Book and Page Number):_____

Current Local Zoning where property is located:

(Include minimum lot size and road frontage requirements):_____

_____

_____

Current tax valuation or recent appraisal (attach if available)

_____

_____

Property's Total Forested Acres:_____

Acres of Cleared/Open Land:_____

Forested Acres of Tract Offered For Forest Legacy:_____

(Complete for Conservation Easement Purchase Only)

LANDOWNER GOALS AND OBJECTIVES

Describe your long term goals and objectives for this parcel:

TRADITIONAL FOREST VALUES

What is/are the traditional use(s) of this forest land? (Examples: timber production, hunting, other outdoor recreation, scenic beauty, etc.)

LANDOWNER COMMENTS

In your opinion, is there a "threat of conversion to non-forest use" of the parcel proposed for enrollment in the Forest Legacy Program? Be specific:

Do you currently have a forest management plan? _____

If so, please provide a copy.

(Complete for Conservation Easement Purchase Only)

Please complete the following section carefully and completely. The information you provide will assist us in deciding upon the eligibility and desirability of the parcel as well as its appraised value and ranking. **Note that checking "retain" does not limit your ability to negotiate price and options in the future; it merely assists us when evaluating your parcel.**

Indicate which of following interests you desire to retain: (Those marked "retain" should be the rights you want to keep. All other rights may become the property of the State of South Carolina upon successful completion of negotiations between the State of South Carolina and yourself.)

Retain	**Not Retain**	
___	___	Timber and wood production rights
___	___	Water rights
___	___	Mineral/gas/oil rights (unrestricted access)*
___	___	Mineral/gas/oil rights (restricted access)**
___	___	Pine straw raking
___	___	No public access***
		Retain control of the following recreational activities:* **
___	___	Hunting
___	___	Fishing
___	___	Camping
___	___	Hiking or other passive recreation
___	___	Bicycling
___	___	Horseback riding
___	___	Motorized vehicles access
		Non-forest uses withing easement area** **
___	___	Grazing (amount of area ___acres)
___	___	Farming (amount of area ___aces)
___	___	Road Construction (other than for forest management/protection)
___	___	Buildings and other improvements (amount of area ___acres)
___	___	Other:_____

*Retention of unrestricted mineral/gas/oil rights will exclude that portion of the tract from consideration in the Forest Legacy Program.

**Retention of restricted mineral/gas/oil rights which will allow less than 25% surface occupancy may be consistent with the Forest Legacy Program.

***In order for the tract to be considered for the Forest Legacy Program, the opportunity for public recreation is required.

****Total area of all non-forest uses cannot exceed 25% of the total tract area.

CONFIDENTIAL

The following information shall remain strictly confidential until such time as: 1) the application is approved and all financial transactions are concluded, or 2) all title holders give written permission to release the information.

FINANCIAL INFORMATION

The following recommendations are for preliminary use only. Any final offer will be based on, and cannot exceed, the fair market value, determined by an appraisal meeting federal appraisal standards.

State the value of the interests to be enrolled in the Forest Legacy Program, and the method used to determine that value (appraisal, landowner estimate, etc.)

What is/are the estimated sale price(s) of the interests being offered?

State the value of the landowner(s) contribution, if any, either in donated value of in-kind services or financial.

LIENS AND ENCUMBRANCES

List any and all liens and encumbrances on the property proposed for enrollment in the Forest Legacy Program. Example: utility easements, public rights of way, water flow or use restrictions, septic systems or water easements, deed restrictions, tax liens, etc.

The information provided is true to the best of my/our knowledge and belief. ALL TITLE HOLDERS MUST SIGN.

PRINT NAME(S)	SIGNATURE	DATE
_____	_____	_____
_____	_____	_____
_____	_____	_____

FOR OFFICE USE ONLY

Application Number:_____ Date:_____

FOREST LEGACY PROGRAM - Checklist

With the Forest Legacy Program application package, please submit the following for each contiguous parcel:

___Completed application

___Name(s) and address(es) of other owner(s) of record for this tract

___Signed consent agreement

___Copy of road map indicating location of the property

___Copy of plat or survey map of the parcel

___Legal description (if available)

___Forest management plan (if available)

NOTE: All materials will become the property of the State of South Carolina and are non-returnable.

DISCLOSURE OF THIS INFORMATION IS VOLUNTARY; HOWEVER, FAILURE TO COMPLY MAY RESULT IN THIS FORM NOT BEING PROCESSED.

South Carolina Forest Legacy Area Evaluation Criteria

Each parcel nominated for acquisition under the Forest Legacy Program will be evaluated, in part, by using the following criteria. The total numerical score will NOT be the ultimate deciding factor but will serve as a tool used to prioritize parcels. Below is a list the criteria and maximum points available for each tract. Points will be awarded based on the characteristics of the area and the goals of that particular Forest Legacy Area.

Forest Legacy Parcel Evaluation Criteria

Category	**Weighting** **Maximum Score**
1. Forest Sustainability	80 points
2. Fish and Wildlife Habitat Values	80 points
3. Public Recreation Potential	80 points
4. Level of Conversion Threat	80 points
5. Acquirability	80 points
6. Manageability	80 points
7. Riparian and Hydrologic Values	50 points
8. Threatened and Endangered Species Values	50 points
9. Archaeological, Cultural, Geologic and Historic Resources	30 points
10. Special Considerations	80 points

Maximum Possible Points = 690

Note: Minimum score allowed for consideration in the Forest Legacy Program is 300 points.

Forest Legacy Program

Description of Evaluation Criteria

1. Forest Sustainability: The potential of a parcel to produce forest products including productivity, accessibility, vegetative community, standing timber, management history and location.

--Parcel has the soil productivity and natural vegetative community to produce high quality timber, pulpwood and other forest products.

--Parcel has growing timber stock in place.

--Parcel is located such that products can be transported a reasonable distance to a user.

--Parcel has the ability to access the timber for removal.

--Parcel has the ability to be managed for forest products due to its history and current condition.

–Parcel has diverse timber age and type and creates or provides the opportunity to create species diversity on the tract.

2. Fish and Wildlife Habitat Values: The habitat potential of a parcel for all types of wildlife and fish species including those hunted and fished.

--Parcel contains excellent habitat or habitat potential for game species.

--Parcel contains excellent habitat or habitat potential for game fish including cold-water trout, black bass, sunfish and others.

--Parcel contains significant populations of resident species.

--Parcel contains good or excellent habitat or habitat potential for forest inhabiting or grassland bird species.

--Parcel contains good or excellent habitat or habitat potential for significant populations of forest inhabiting mammals, reptiles, amphibians and invertebrates.

--Parcel contains areas for resting and feeding of migratory species.

--Parcel exhibits connective habitats, corridors, habitat linkages and areas that reduce biological isolation.

--Parcel borders other protected/managed lands

3. Public Recreation Potential: The potential of a parcel to provide the public with outdoor recreation potential including hunting, fishing, hiking, birding, horseback riding, wildlife observation, and other types of recreation. Parcels to be owned and managed by SCDNR must be compatible with SCDNR's Recreational Use Policy.

--Parcel is accessible for management activities.

--Parcel is externally accessible to the public by automobile or boat and internally accessible by reasonable means.

--Parcel has potential water-based recreational value.

--Parcel has unique habitat, geological formation, wildlife population or other special recreational attraction.

–Parcel has potential for inclusion in the Wildlife Management Area Program.

--Parcel is compatible with SCDNR's Recreational Use Policy (if to be owned and managed by SCDNR).

4. **Level of Conversion Threat:** The parcel is threatened by conversion from managed forest into other land uses by residential development, commercial development, infrastructure development, or subdivision into smaller parcels.

--Parcel is in danger of conversion to non-forest use within 10 years.

--Parcel is currently for sale on the open market.

--Parcel may remain wooded, but will become further subdivided within 10 years.

--Parcel is located where infrastructure extensions and improvements are imminent.

--Parcel may remain wooded, but is in danger of non-sustainable management.

5. **Acquirability:** The potential ability of a managing entity to acquire the parcel easily.

--Parcel is available from a willing seller at a reasonable price.

--Parcel has clear title and no other legal or social complications.

--Parcel is available with the 25% match funding donated by the current owner or 25% nonfederal match is readily available.

--Parcel has significant opportunity to leverage multiple funding sources for acquisition.

6. **Manageability:** The potential ability of a managing entity to manage the area in a cost effective and efficient manner.

--Parcel is accessible for management activities.

--Parcel can be managed economically due to location, topography, vegetative community and other concerns.

--Parcel is located such that management activities such as burning, timber harvest and other activities will not be restricted.

--Parcel can accommodate proposed priority uses and management activities without degrading its natural value.

--Parcel can be protected from future degradation by activities occurring on neighboring properties.

--Parcel is close to other SCDNR properties or other conservation areas.

7. **Riparian and Hydrologic Values:** The parcel contains wetlands that have ecological values including unique habitats, flood control, sediment filtration, and contaminant filtration.

--Parcel is situated on a river, stream or marine shore.

--Parcel has extensive river, stream or marine shoreline.

--Parcel includes the 100-year floodplain.

--Parcel includes a designated scenic river, stream or wetland.

--Parcel contains minimum 50-foot buffer of trees along shorelines as a sediment buffer.

--Parcel contains ecologically significant wetlands such as isolated bays, bogs, depression meadows and ponds.

--Parcel is adjacent to or near other protected wetlands.

--Parcel includes the surface watershed or the recharge area of a ground water aquifer for a public water supply.

8. Threatened and Endangered Species: The parcel contains populations or suitable habitats of rare, threatened or endangered species of fish, wildlife or plants.

--Parcel contains known occurrences of rare, threatened or endangered species of animals or plants or will serve as a buffer for such property.

--Parcel is within close proximity to a site with known occurrences of species of concern.

--Parcel contains habitats that are suitable for reoccupation of such species.

--Parcel contains habitats that often harbor such species.

--Parcel is contiguous to Heritage Trust or other protected properties with similar habitat.

9. Archeological, Cultural, Geologic and Historic Resources: The parcel contains known or likely sites of significant historic or cultural value.

--Parcel contains forest related cultural resources such as a historic forest, mill site, tar kiln or other forest industry site.

--Parcel contains other historic or archaeological resources such as Native American sites, historic structures or historic sites.

--Parcel contains significant rock formations, waterfalls, earth strata, or limestone bluffs.

10. Special Considerations: The parcel has special attributes that are not accounted for in 1-9 above. Examples of special considerations include but are not limited to:

–Parcel is located within an area of special interest including but not limited to a Focus Area or Scenic River corridor

--Parcel borders a scenic highway and/or contains a panoramic view or other scenic resources.

--Parcel is available at a low cost per acre.

--Parcel is located in an area with limited public recreation or limited resource protection in place

--Parcel will leverage significant conservation action or provide conservation opportunities on adjacent tracts.

--Parcel has a desirable size and shape.

--Parcel has established roads, wildlife openings, etc.

–Parcel is located near other areas of conservation efforts.

--Parcel provides excellent opportunities for education or research related to SCDNR mission.

--Parcel will leverage significant conservation action or provide opportunities on adjacent tracts.

SOUTH CAROLINA FOREST LEGACY PARCEL EVALUATION PACKAGE

Contents:

***Cover sheet**: To be completed with information supplied on the application form. The landscape description is meant to include the physical characteristics of the surrounding area including topography, soils, and surface and ground water hydrology; brief inventories of major vegetative groups, fish and wildlife resources, scenic resources and any other forest resources; as well as surrounding land uses. The parcel description is meant to include an in-depth description of the above mentioned items, but as they pertain to the parcel. Use additional sheets as needed. This sheet will be completed by investigating personnel directed to do so by the State lead agency.

***Parcel Evaluation Sheet:** This sheet will be completed by personnel directed to do so by the lead agency, in consultation with investigating personnel and the Forest Legacy Committee.

***Scoring:** The final numerical score will not be used as the sole factor in determining which parcel/interest should be acquired but merely as a guide to relative values of the resource under evaluation.

COVER SHEET

SOUTH CAROLINA FOREST LEGACY PROGRAM PARCEL EVALUATION PACKAGE

Forest Legacy Area_____

File Number: _____ Date of Evaluation_____

Landowner's Name_____

Parcel Location _____

Legal Description _____

On Site Investigators _____, _____

Landscape Description:

Parcel Description:

South Carolina Forest Legacy Parcel Evaluation Criteria

Parcel Name:_____ Owner:_____

County:_____ Acres:_____

Location:_____

Forest Legacy Area _____

Evaluator Name(s)_____

Category	**Weighting**					
	None	**Poor**	**Fair**	**Good**	**Excellent**	**Score**
1. Forest Sustainability	0*	20*	40	60	80	_____
2. Fish and Wildlife Habitat Values	0*	20	40	60	80	_____
3. Public Recreation Potential	0*	20	40	60	80	_____
4. Level of Conversion Threat	0*	20*	40	60	80	_____
5. Acquirability	0*	20	40	60	80	_____
6. Manageability	0*	20	40	60	80	_____
7. Riparian and Hydrologic Values	0	10	20	35	50	_____
8. Threatened and Endangered Species Values	0	10	20	35	50	_____
9. Archeological, Cultural, Geologic, and Historic Resources	0	5	10	20	30	_____
10. Special Considerations	0	20	40	60	80	_____

Final Score:_____

Maximum Possible Points = 690

Note: Minimum score allowed for consideration in the Forest Legacy Program is 300 points.

*A tract with such a rating will not be considered eligible for acquisition as part of the Forest Legacy Program.

Comments:

APPENDIX D

Threatened and Endangered Species in South Carolina

Animals (23)

Status	Species/Listing Name
E	Bat, Indiana *(Myotis sodalis)*
E	Beetle, American burying *(Nicrophorus americanus)*
E	Curlew, Eskimo *(Numenius borealis)*
E	Heelsplitter, Carolina *(Lasmigona decorata)*
E	Panther, Florida *(Puma (=Felis) concolor coryi)*
E	Pelican, brown except U.S. Atlantic coast, FL, AL *(Pelecanus occidentalis)*
T	Plover, piping except Great Lakes watershed *(Charadrius melodus)*
E	Puma (=cougar), eastern *(Puma (=Felis) concolor couguar)*
T	Salamander, flatwoods *(Ambystoma cingulatum)*
T	Sea turtle, green except where endangered *(Chelonia mydas)*
E	Sea turtle, hawksbill *(Eretmochelys imbricata)*
E	Sea turtle, Kemp's ridley *(Lepidochelys kempii)*
E	Sea turtle, leatherback *(Dermochelys coriacea)*
T	Sea turtle, loggerhead *(Caretta caretta)*
T	Snake, eastern indigo *(Drymarchon corais couperi)*
E	Stork, wood AL, FL, GA, SC *(Mycteria americana)*
E	Sturgeon, shortnose *(Acipenser brevirostrum)*
E	Warbler (=wood), Bachman's *(Vermivora bachmanii)*
E	Whale, finback *(Balaenoptera physalus)*
E	Whale, humpback *(Megaptera novaeangliae)*
E	Whale, right *(Balaena glacialis (incl. australis))*
E	Wolf, gray Lower 48 States, except where delisted; where XN; and Mexico. *(Canis lupus)*
E	Woodpecker, red-cockaded *(Picoides borealis)*

Plants (19)

Status	Species/Listing Name
T	Amaranth, seabeach *(Amaranthus pumilus)*
T	Amphianthus, little *(Amphianthus pusillus)*
E	Arrowhead, bunched *(Sagittaria fasciculata)*
E	Chaffseed, American *(Schwalbea americana)*
E	Coneflower, smooth *(Echinacea laevigata)*
E	Dropwort, Canby's *(Oxypolis canbyi)*
T	Gooseberry, Miccosukee *(Ribes echinellum)*
E	Harperella *(Ptilimnium nodosum)*
T	Heartleaf, dwarf-flowered *(Hexastylis naniflora)*
E	Loosestrife, rough-leaved *(Lysimachia asperulaefolia)*
T	Pink, swamp *(Helonias bullata)*
E	Pitcher-plant, mountain sweet *(Sarracenia rubra ssp. jonesii)*
T	Pogonia, small whorled *(Isotria medeoloides)*
E	Pondberry *(Lindera melissifolia)*
E	Quillwort, black spored *(Isoetes melanospora)*
E	Sumac, Michaux's *(Rhus michauxii)*
E	Sunflower, Schweinitz's *(Helianthus schweinitzii)*
E	Trillium, persistent *(Trillium persistens)*
E	Trillium, relict *(Trillium reliquum)*